Traveling with Albrecht Dürer - A Case Study for Uncertainty-Aware Biography Visualization

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Abstract

Synoptic accounts on the 'life and work' of artists constitute one of the central genres of art history. Especially for well-known historical figures, multiple biographies accumulate over time which motivates succeeding scholars to establish their contributions and argumentative arcs with an assertive style and to rather downplay the interpretive ambiguities and uncertainties which engulf many aspects and sources of every biography. Aside from many other innovations, digital approaches to biography representation can counteract this tendency and make layers of interpretive, historical complexity explicit and thus also map out biographical controversies about lives and works.

With a biography visualization case study we focus on Albrecht Dürer to showcase novel strategies to communicate relevant stations of his life and works in an integrated fashion, including uncertainties and biographical gaps. For that matter, we will have a look at both his overall biographical trajectory and on an episode known as the "Journey to the Netherlands" (1520–1521). Choosing a narrative representation based on a space-time cube perspective, we visualize both Dürer's biography and a specific time-span known as his Journey to the Netherlands—and we discuss options how to complement such a descriptive perspective with data quality indicators to highlight biographical uncertainty and ambiguity. As such, we also hope to showcase how the often-heard charge of an inherent 'positivist bias' of data visualizations could be inverted and utilized for the explication of interpretive ambiguity and plurality.

Keywords

Visualization, storytelling, biographical data, uncertainty, art history, digital humanities

1. Introduction

Albrecht Dürer (1471–1528) counts among the most important figures of Western art history. Already in his lifetime, he gained international renown and was invited by princes and city dignitaries both north and south of the Alps. Thanks to his own travels and his widely sold prints, his works were quickly spread all over the globe and now form the pride of museums and

collections worldwide [1, 2]. Dürer is surely one of the best documented artists from the early modern times with a fairly large amount of autobiographical material and other primary sources. The first biographical accounts on Dürer were already compiled in the early 16th century and since the mid-18th century, his life and work became regularly the subject of monographic studies and catalogues raisonnés. Dürer's biography has been subject to in-depth study by many modern art historians, drawing on both primary sources and later biographies as well as his vast oeuvre.

Looking more closely at these studies, however, a problem of 'traditional' biographical narratives becomes obvious: Biographical writing in art history constitutes a highly developed and sprawling field of study [3] based on diverse models, methods, and strategies. Biographical accounts range from the most complex and fine-grained monographical studies to compact overviews in art historical lexica. However, due to prevailing epistemic cultures and customs, actually developed since the ancient times, the descriptive aspects of art historical "life and work" surveys are often strongly interwoven with larger argumentative arcs, and with the distinct perspectives and positions art historians want to establish as their unique interpretation. For that matter, a certain assertive style is dominant, which aims for a seamless depiction according to the chosen scholarly perspective, and which often tends to diminish uncertainties, ambiguities, controversies, open questions, or simply the lack of historical sources as well as clearly datable and attributable works of art [2, chapter 2].

2. Motivation

Against this background of great amounts of 'traditional' biographical knowledge—interlaced with competing claims of validity and certainty—this article aims to do both: Showcasing how digital methods can make complex biographical descriptions newly accessible by methods of data visualization, and exploring how methods of uncertainty visualization can make interpretive controversies explicit. In contrast to the notion of an inherent 'positivist bias' of digital methods, we consider the self-conscious representation of omnipresent uncertainties and interpretive controversies to be a scholarly desideratum that digital methods can support. By leveraging an extended spectrum of visual encoding options we argue for making data provenance—together with parameters of imprecision, ambiguity or absence of sources—explicit in future visualization-based accounts of biography and prosopography representations. This could help to establish visual transparency on all descriptive levels to allow for a more nuanced assessment and representation of critical-historical, interpretive complexity. Instead of regarding uncertainty as an inconvenience and exception, it should be taken as a basic fact and corner stone in biographical writing and visualization.

3. Related Work

The digital transformation of arts and humanities methods brings along fascinating new options to deal with (i.e. to search for, create, curate, analyze, and communicate) cultural data, and to go beyond text-based formats by also visualizing arts and humanities data in various constellations [4, 5]. With regard to art-historical knowledge, the last decades have seen a multitude of

initiatives to build large biography data collections—mostly on a national level [6], which store information on the most important life events of thousands of artists and enable new forms of prosopographical research [7] and allow new ways of visual access to them [8, 9, 10, 11, 12]. Regarding artworks and cultural artifacts, cultural information often accumulates in object-oriented archives—whether for individual artists or in bigger databases which aggregate large numbers of subcollections [13]. Collection visualizations allow for more generous overviews and open up more intuitive ways to explore these object collections [14, 15, 16, 17]. Very few approaches have managed to integrate and mediate both aspects so far, e.g. to represent and also visualize both object and biography information in an integrated fashion, and almost none of them addresses the topic of uncertainties so far [18, 19].

With a current European project (https://intavia.eu), a consortium has formed to go beyond the current state of siloed cultural information and to bridge and connect data both across national boundaries, as well as across typological boundaries, so that a transnational and balanced (i.e. object- and biography-oriented) interpretive perspective can arise. For that matter, the emerging InTaVia platform allows querying large existing data collections, but also enriching and refining object or biography data manually, e.g. to either analyze or communicate it with integrated visualizations [20, 21]. In the context of this project, various case studies on individual artists—among them Albrecht Dürer—have been set up to investigate options of data curation and the corresponding visualization design space.

Regarding the work of Albrecht Dürer, many of his works are available in digitized form—even though they are dispersed across multiple museums and their respective databases which generate and operate by means of heterogeneous inventory data and data formats. Currently, a relational database on Dürer is under construction, which draws together large parts of his works together with related persons, institutions, primary sources, and secondary literature [22]. While this data collection focuses on Dürer's works in terms of tangible objects he created, it also offers a few aspects of biographical information (e.g., information on birth, death, as well as selected person relations) based on structured data available via links to different authority files (e.g., in GND, ULAN). However, as with many other artist databases, this project does not provide a detailed biography of Dürer for art-historical analyses, it does not represent information and data uncertainty in a structured fashion, nor does it integrate options of visual data representation or narration for both work and life.

4. Data Creation and Curation

While the InTaVia platform will allow art historians and any other interested person to start their inquiries by querying a transnational knowledge graph, also an open JSON-based data schema is under development that will enable users to import their local data collections on the life and work of specific artists or art schools for a more specific investigation. To simplify the related workflow, a pre-formatted spreadsheet will allow historians or topic experts to fill in biographical data points, consisting of time-stamped biographical events, which are frequently tied to a geographic location, as well as to objects, people, or institutions, and which can be accompanied with any sort of event description or further comments, including remarks on data provenance or data uncertainty. Based on this schema, we manually recreated a slimmed-down

account of Dürer's overall biography (with 29 data points), as well as a fine-grained account of his journey to the Netherlands of 1520–1521, consisting of 158 travel-related events, mostly documented in his so-called travel "diary" as well as by a number of works of art transmitted from this period.

Albrecht Dürer's so-called "Diary of the Journey to the Netherlands" is the most extensive autobiographical travel account by a 16th-century artist. While the original manuscript is lost, its contents have been preserved and transmitted through two handwritten copies from around 1600 considered to be rather close to the original ([23], with a transcription of both copies in the annex). The diary consists of detailed descriptions of places, events, and encounters, but in particular also of the expenses as well as earnings related to the journey. This diary not only allows us to trace Dürer's itinerary very closely, but also to relate places to people, works of art, and various activities, as well as to the duration and costs of those activities. However, due to the predominantly economic purpose of this "diary", Dürer frequently omitted events that were not related to any expenses or earnings. For example, he meticulously lists the costs for food and accommodation as well as all the toll stations during the first part of this journey from Nuremberg to Cologne, which allows to follow his travel route sometimes on an hourly basis. By contrast, for the second part of his outbound trip from Cologne to Antwerp, this sort of information is scarce, which makes it difficult to retrace the entire itinerary in detail. The artist had probably negotiated some sort of fixed rate with the carter, possibly including accommodation in some places, and the toll system was different in this part of the Holy German Empire. In addition, major changes in the topography of this region—now divided between Germany, Belgium, and the Netherlands—make it difficult to identify the ancient place names given in the "diary" in some cases [23, chapter 1].

For more than a century, scholars from various disciplines—i.e. art historians, historians, philologists, geographical historians—have tried in vain to fully reconstruct Dürer's itinerary. Among these, detailed reconstructions of Dürer's itinerary and whereabouts are discussed most frequently and most controversial. Such a reconstruction not only impacts our understanding of Dürer's life but also a better dating and contextualization of his works—and thus his personal and artistic development. Regarding his so-called "first" journey to Italy, contemporary sources do not inform about the day of departure and return, his itinerary, destination(s), or shorter or longer stays during the journey. Up until now, dating of related works of art (mostly watercolor landscapes and architectural views of places in the Trentino region) varies by month and sometimes year. The same is true for Dürer's other travels and especially his journey to the Netherlands. Due to the lacunary information provided by the "diary" and other historical or cartographical sources, many scholars have superposed information with inferences and interpretations. As is often the case with biographical writing, scholarly biographical narratives tend to become more authoritative than the actual "life" of a person—here understood as a sequence of fact-based events. Looking at Dürer's life and his journey to the Netherlands from this more fact-based perspective, the gaps or non-documented periods or phases of his life come into view. Instead of being omitted from the reconstruction of his life, gaps would become equally important and expressive parts of scholarly representations.

In previous monographic studies on Dürer's life and works as well as on his journey to the Netherlands, we have tried to pay specific attention to the issues and challenges posed by biographical gaps and uncertainties [23, 1]. While it is often difficult to fully comply with this
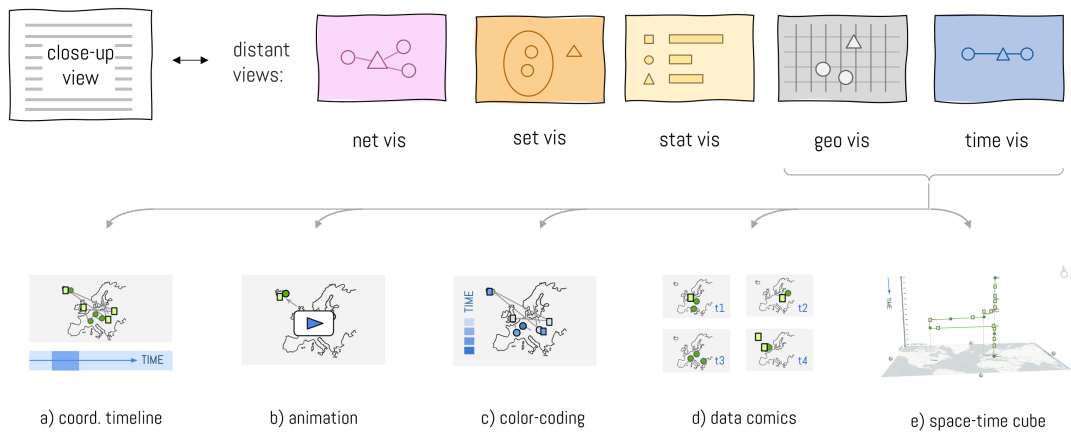
Figure 1: Options to visualize the essential time-orientation of biography data (here with focus on geographic space) explored by the InTaVia project, including (from left to right) a coordinated timeline visualization, animation, layer juxtaposition, color-coding, and a space-time-cube perspective.

task in the course of a written reconstruction of an artist's life or a specific episode from his life, geo-temporal data visualization tools offer novel possibilities to visualize all available and unavailable information by also unveiling biographical lacunae or blank spaces. Ideally, data visualizations thus can help to reduce certain biases in reconstructing an artist's life and work by treating information and non-information (including uncertainties, ambiguities, and lack of data) as equally important parts of a person's biography.

5. Visualization Case Study

To support the comprehension and reasoning processes of its future users, the InTaVia platform builds up two visualization components: A so-called *Visual Analytics Studio* will enable experts to look at various data selections from multiple data visualization perspectives, including maps, sets, graphs, and faceted timelines (see Figure 1, top). A so-called *Visual Storytelling Suite*, on the other hand, will enable subject matter experts and scholars to use methods of visualization-based storytelling to convey biographical accounts by narrative means to a wide range of non-expert audiences[24]. With the intrinsic time-orientation of biography data playing a central role in all of these various visualizations (i.e., not only from a explicit timeline perspective), the consortium explores multiple options to encode time within other (otherwise non-temporal) types of representations, such as graphs, sets, or maps. For that matter, Figure 1 (bottom) shows various options to incorporate temporal information in maps, which have been discussed and evaluated together with a large group of cultural heritage and (art) history experts, to anchor the project's design decisions in the principles of user-centered design [21]. From these options, the space-time cube perspective (bottom right) drew a significant amount of interest, which led to the further exploration of this perspective with the case study data of Albrecht Dürer with the GeoTime software package [25].
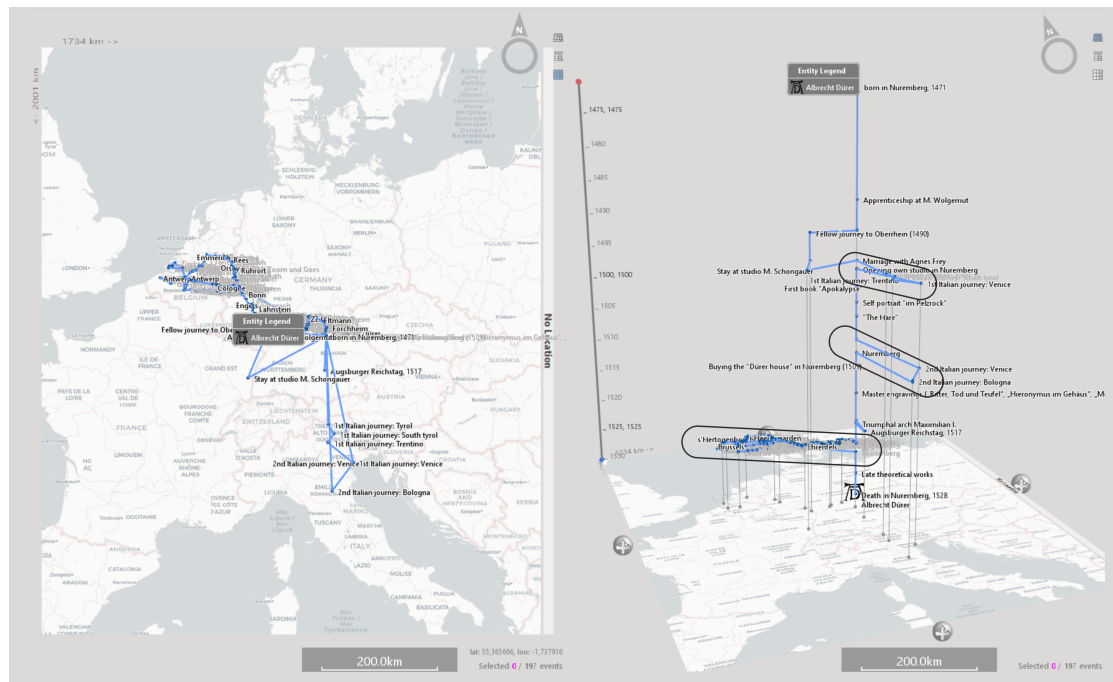
Figure 2: Dürer's biographical trajectory, to be read from top to bottom, from an orthogonal cartographic (left) and a space-time-cube perspective (right).

For the above-mentioned coarse-grained data of Dürer's entire biography, Figure 2 introduces both an orthogonal bird-eye view on his transnational trajectory (left) and a complementary space-time perspective, where the chronological flow of events is mapped from top to bottom. By the means of users' interaction with this view (e.g., by operations of rotating, panning, zooming, as well as drill downs on data selections), the visualization discloses essential temporal information and sequential patterns, which remain hidden from the bird-eye view. Three manual annotations further mark Dürer's three major journeys (two to Italy and one to the Netherlands), which have been deemed an undeniable factor and driver of both the development of Dürer's style and artistic concepts as well as of his transnational reputation [26]. As a matter of fact, Dürer's Italian journeys are largely modern (re-)constructions. This is especially true for his so-called first journey to Italy, which he is thought to have undertaken as a young artist shortly after his marriage in 1494. This journey is only documented by a handful of architectural and landscape views from the Trentino region (which do not necessarily imply a longer stay in Venice) and by a random remark that can be found in one of his letters written a decade later. Only very few scholars have challenged the dominant narrative of Dürer's Italian journeys altogether (i.e. [27]) or put the supposed beginning of the first journey in mid-1494 into question. The latter assumption was first brought up by art historians around 1900 and is now treated as a fixed fact in Dürer's biography which has even made it into his GND entry [28], while it is still part of an active controversy among art historians. When visualizing Dürer's travels and his itinerary it is thus necessary to clearly distinguish documented events from mere suppositions in order not to strengthen any misassumptions.
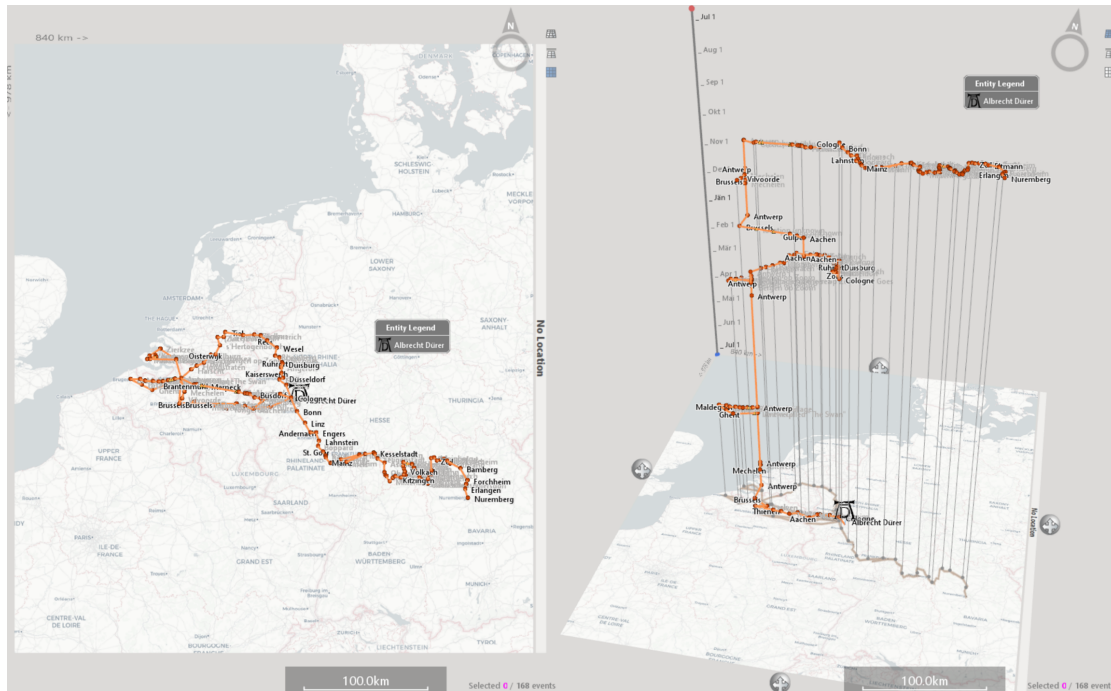
Figure 3: The journey to the Netherlands, visualized from an orthogonal (left) and a space-time-cube perspective, the latter to be read from top to bottom.

Dürer's best documented journey is indeed his journey to the Netherlands thanks to his "Diary" as well as to other contemporary sources. As many of this journey's events included the production, trading, or strategic donation of artworks to actors of the German, Flemish and Dutch cultural field as well as European princes and members of international merchant houses (from a modern perspective, Dürer aimed to build up his network of clients and customers), the InTaVia project develops methods to also visualize creation events of cultural objects in joint with (previews) of the resulting artifacts (a details on demand-perspective which the GeoTime package is not able to display).

Figure 3 practically zooms in on this third big journey and details the geo-temporal trajectory of the journey to the Netherlands. From top to bottom, it discloses Dürer's travel patterns, including his main movements and stopover episodes, comprising encounters with princes and dignitaries, creation and exchange of works of art, and notable artworks visited, but also everyday life activities such as the purchase of food or going to the bathhouse.

At the bottom of this representation, we can see the early ending of the documented outbound itinerary of 1520, which results from the above-mentioned lack of diary entries with clearly identifiable locations, leaving room for speculation how the itinerary exactly unfolded from Cologne onwards. The visualization shows the most probable route, based on an average daily distance of ca. 40-60 kilometers.
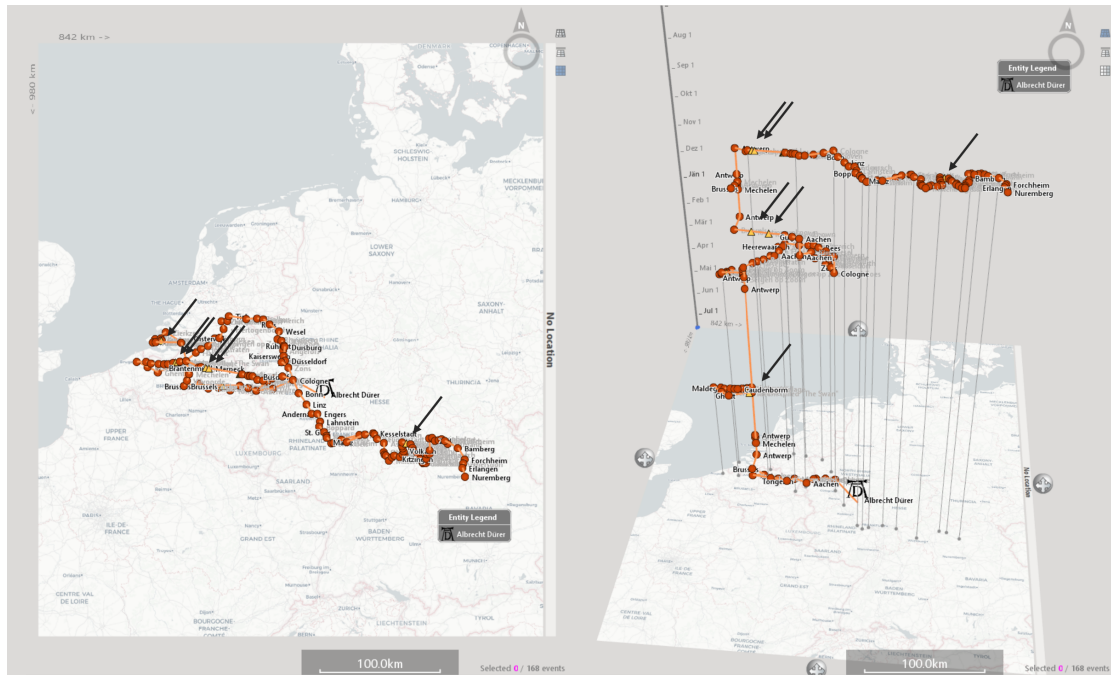
Figure 4: Dürer's journey to the Netherlands, including indicators for uncertainty about historical place names, marked by yellow triangles on the artist's trajectory and further emphasized by manually annotated arrows.

6. Uncertainty Visualization

Complementing the descriptive perspectives of geo-temporal movements, the InTaVia project will put a specific focus on questions how to make biographical uncertainty, ambiguity, and interpretive controversy explicit—which actually engulf many data points of Dürer's biography and work, and even more so the biographical accounts of other, less prominent figures of cultural history.

Instead of ignoring or even cutting and ironing out uncertainties, ambiguous or controversial elements will be treated as integral parts of a person's biography, and will be made visible for experts by superimposing visual data quality indicators on demand. Figure 4 shows how the GeoTime package allows to include different types of icons as data points of the spatio-temporal trajectory. In this specific case, yellow triangles (and manually annotated arrows) mark data points which are only based on "best guesses" about the meaning of historical place names from Dürer's diary.

Such representations of uncertainty—which remain rather indiscernible in the visual idiom of the GeoTime package—will be further developed by the InTaVia project, so that users can make such 'negative' knowledge aspects highly salient on demand. In fact, a whole range of exploratory visualization studies has shown in recent years that a great variety of design options can convey the values and measures of data uncertainty [18]. Figure 5 assembles a variety of these methods which have been introduced in the visualization realm to make varying

i. Options to visualize **uncertainty of object information** by glyph modifications

ii. Options to visualize **temporal uncertainty**

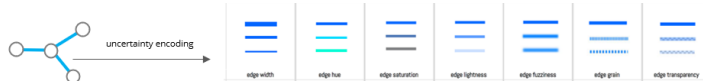iii. Options to visualize **relational uncertainty**

Figure 5: Options to visualize uncertainty for geographic marks (top), for temporal marks, and for relational marks (bottom).

data quality measures visible for geographic visual marks (top), for temporal marks (e.g., on a timeline view, center), or for relational marks (e.g., encoding the social interactions between persons or the chronological sequences of a trajectory). As a consequence, scholars and users of future biography representations will be able to shift the visual emphasis from a rather seamless depiction of the "best positive guess" about a historical actor's space-time path to all those structural features which are uncertain, contested, or flat-out missing. From a collective art-historical point of view, this increase of descriptive and visual uncertainty arguably could yield the greatest long-term gains, as representations would not only include all known research gaps, interpretive debates and open questions, but practically also convey other scholars and students with directions for future work.

7. Discussion & Outlook

With this exploratory visualization case study on Dürer's travels, we elaborated on ways and means how to make extensive, existing accounts of artists' 'lives and works' visible to future users of digital, art-historical knowledge bases. While such databases and the development of related visualization methods have seen major progress in recent years, research has also documented a whole spectrum of recurring challenges. Transformed into short descriptive statements, these include:

- *Data is sparse.* Given the omnipresent scarcity and sparsity of preserved information and knowledge about most historical actors, the InTaVia project aims to intertwine scalable options of automated data creation (such as natural-language processing and entity extraction from historical texts) with options for manual data curation. Methods of the latter type will allow to build on the best possible data that automated data creation methods can provide – and to enrich the resulting backbone representations with many

further data points, entities and relations, known to human experts from various other qualitative sources. This is especially important with regard to historical source material which is often lacunary by nature and thus needs data editing and validation by scholars specialized in a certain field of study.

- *Data is uncertain.* Due to the genuine uncertainty and ambiguity that is engulfing many aspects of art-historical and biographical accounts, we do not only see need for corresponding methods of uncertainty visualization (see ch. 6), but also for a related change in academic customs and scholarly writing and working culture. As outlined above, we see the chance of using digital tools to actually foster the collaboration between experts by the means to make uncertainty explicit. Uncertainty, ambiguity, and competing claims of validity are known to have different effects on and relevance for different audiences [29], including the visual and cognitive overload for casual users. By contrast, experts users tend to profit and benefit from the availability of uncertainty indicators, as they do not only strengthen their trust in digital tools [30, 31], but they also allow for more nuanced assessments and historical judgments, while making areas and directions of future work transparent. As such, visual indicators of uncertainty have only started to make their way into biography/prosopography [32] and collection visualization [33, 18], even though their importance for visualization in the digital humanities has been acknowledged for some time [34, 35, 29].

- *Data is autotelic.* Cultural and especially art-historical data includes a significant amount of digital objects with an 'intrinsic', aesthetic value and relevance, i.e., of objects which have been collected and preserved over time due to their aesthetic appeal and their self-rewarding value. Among others, this creates the specific requirement to not only complement modern-day distant viewing environments with "generous" close-up views [36]. However, it also creates the necessity for distant viewing tools and their designers to not fall (far) behind the aesthetic qualities of their primary objects when designing 'scalable' frames, as the acceptance to work with 'ugly' tools is notably limited for aesthetically motivated experts [37], but also for the lion share of casual users or 'information flaneurs' which are known to be driven by experiences of emotion, pleasure, and curiosity strongly tied to the unique qualities of objects of art [38].

- *Data often has a complex and convoluted provenance history.* Most data in the digital humanities has its own, significantly complex and convoluted history. To enable and foster a nuanced assessment of related visualizations, the designers of interface to arts and humanities data are well advised to make this kind of provenance information and history explicit, as art history scholars are used to build their interpretation and judgment on these chains of historical references and related inferences.

- *Data has different relevance and affordances for different users.* Art-historical data can be of relevance for a whole variety of users, which have more or less expertise and/or digital skills. While experts are known to ask for analytical and exploratory functions, 'lay persons' or casual users are frequently searching for introductory and narrative accounts, with an increased attraction power and a heightened level of engagement and user experience. For that matter, the InTaVia project pairs expert-oriented tools for the visual analysis of art-historical data with tools for storytelling and story consumption [24].

- *Visualizations are non-neutral.* Visualizations and visualization-based tools are late-modern, cultural artifacts themselves, which require not only a basic level of visualization literacy, individual appropriation and interpretation, but also frequently their own share of methodological and epistemological critique. Strategies to support corresponding processes include methods of visualization onboarding [39], tools for individual data curation and annotation of visualizations, as well as means for critical, discursive exchange with both the data, but also with tool developers [40]. The case study presented with this paper was essentially motivated by such question of data and tool critique (including the revision of existing tool critique) and explored ways and means to overcome related challenges with next-generation data and tool development.

Most of these data-related challenges outlined above are also an essential part of 'traditional' art-historical research and thus are thoroughly reflected upon in the monographic texts that dominate the scholarly culture of the art-historical field. However, in contrast to the sequential style of 'traditional' biographical writing, data visualizations allow for synchronic, multi-level rendering of information. Given a corresponding interest, future representations of "lives and works" of artists thus will be able to draw together manifold biographical interpretations, highlighting both commonalities and interpretive differences. Within or across individual accounts, techniques of uncertainty and provenance visualizations will allow to make ambiguity, interpretive uncertainty, and also the frequent lack of sources explicit. As such, there is hope that the often heard charge of an inherent 'positivist bias' of data visualizations [41] could be inverted by deliberately re-appropriating digital tools for the 'de-positivization' of traditional, art-historical accounts, and for making the many layers, fractures, gaps, and controversies of bigger art-historical pictures transparent.

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