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# Challenges for visualising spatial and chronological distribution of medieval manuscripts: towards new ontologies

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## Abstract

Early medieval manuscripts, i.e., mostly parchment-based codices produced in the post-Roman West between 400 and 1000, pose particular data modelling challenges. They are, by nature, complicated entities that escape easy classification when it comes to structuring data. In particular, when trying to represent their distribution on a map, they are difficult to represent as a set because of the inherent uncertainty surrounding their categorization. Specialised knowledge representation always poses narrative constraints (Fafinski 2020) and is heavily dependent on context (Faber 2016). But in the case of early medieval manuscripts numerous additional problems arise. For example, *what* exactly do we date when we date such an object? Elements such as script, parchment, binding, content, and codicological changes all play a role. Being inherently organic, early medieval manuscripts can contain multiple dating states.

Statistical attempts to date ‘undated’ manuscripts often fall into the trap of similarity, where a date is considered just a missing parameter that can be approximated (Feuerverger et al. 2008), thus assuming that a certain date exists and needs to be “worked towards” by comparison with other, supposedly precisely dated, manuscripts. This is an untenable assumption and the results of such investigations are consequently flawed.

Thus we can identify a number of problems when it comes to fitting early medieval manuscripts inside existing ontologies. They are by their nature fuzzily dated and fuzzily localised[MP1]. The core item, the manuscript itself, is not actually a persistent item. The key actor for the entity is not the author: it is the scribe, who represents both an actual person and the particular iteration of script (the hand), which can possess disjointed dating states. (Hassner et al. 2013). Moreover, multiple temporal and authorial states exist. Our knowledge is dependent on the knowledge production of our field. But this knowledge production is also beset by uncertainty.

A number of solutions have already been proposed. EDTF offers various dating options (range model, one of a kind, series), as does CIDOC CRM (activities with a broad range of states). In TEI we can extensively use the “evidence attribute” to highlight the historiographical uncertainty. But at the end of the day, those solutions merely tend to mask the fuzzy character of the early medieval manuscripts, building towards a “snapshot” for cataloguing (Fagin Davis 2019).

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Outside the cataloguing environment we rarely need the "snapshot ontologies". When we work towards visualising spatial and chronological distribution of early medieval manuscripts we should actually embrace uncertainty as the new standard. In a way it brings us back to the way old printed catalogues modelled their data, where, under the disguise of Aristotelian categorization, fuzzy models were standard. (Lowe 1934–1966) Similarly, it is possible to use ontologies to represent vague specialised knowledge (Bobillo et al. 2012).

Nowadays we have at our disposal methods that can help us achieve this turn towards expressing the fuzzy character of early medieval manuscripts. In a case study for this presentation, we have analysed manuscripts of Bede's and Orosius' works (using the data from printed catalogues) and plotted their approximate spatial and chronological distribution onto a map. By using k-means clustering and defining regions for uncertain locations, instead of trying to approximate an often non-existent ideal "snapshot" location and date, we aim to represent uncertain properties on a static map. Applying digital humanities approaches to a set of research questions that are based on a manuscript-driven source base offers new possibilities. Instead of trying to force the chronological and spatial distribution into fixed categories, the method tries to embrace the uncertainty of our knowledge.

By necessity such maps have to be layered as they need to include models of historiographical uncertainty – the underlying problem of *what* is being dated and by whom can only be solved by pluralistic visualisations or codicological and palaeographical interventions. This method directly addresses the problem of *what* is being dated by showing that the k-means clustered distributions essentially reflect the palaeographical categorisation of scripts, fixed more or less at the point of scribe's training. Building on the old, but now refreshing to read, notion of historiography as a cybernetic exercise *par excellence* (Topolski 1984), the project may be seen not only as a step towards new methods of early medieval manuscript visualisations, but also towards a more independent digital humanities methodology.

Ontologies remain a cornerstone of digital data organisation (Winslow et al. 2019) and a growing number of attempts to venture into fuzzy ontologies (Bobillo and Straccia 2011; Cross and Chen 2018) are opportunities for incorporating the particular character of early medieval manuscripts. But ultimately, we need an ontology of historical and historiographical uncertainty.

## Bibliography

Bobillo, F., Gómez-Romero, J., León Araúz, P., 2012. Fuzzy Ontologies for Specialized Knowledge Representation in WordNet, in: Greco, S., Bouchon-Meunier, B., Coletti, G., Fedrizzi, M., Matarazzo, B., Yager, R.R. (Eds.), *Advances on Computational Intelligence, Communications in Computer and Information Science*. Springer, Berlin, Heidelberg, pp. 430–439. [https://doi.org/10.1007/978-3-642-31709-5\\_44](https://doi.org/10.1007/978-3-642-31709-5_44)

Bobillo, F., Straccia, U., 2011. Fuzzy ontology representation using OWL 2. *International Journal of Approximate Reasoning, Selected Papers - Uncertain Reasoning Track - FLAIRS 2009* 52, 1073–1094. <https://doi.org/10.1016/j.ijar.2011.05.003>

Bruseker, G., Hours, B., Vogeler, G., Schlögl, M., Petram, L., Van Lottum, J., Van Koert, R., Riechert, T., Marx, E., Blanke, J., Beretta, F., Ferhod, D., Alamercery, V., 2018. On the Way to Semantic Interoperability for Historical Data: the Data for History Consortium, in: *EADH 2018 – Detailed Programme*. Presented at the First annual conference of the European Association for Digital Humanities EADH 2018, p. 11.

Cross, V., Chen, S., 2018. Fuzzy Ontologies: State of the Art Revisited, in: Barreto, G.A., Coelho, R. (Eds.), *Fuzzy Information Processing, Communications in Computer and Information Science*. Springer, Cham, pp. 230–242. [https://doi.org/10.1007/978-3-319-95312-0\\_20](https://doi.org/10.1007/978-3-319-95312-0_20)

Faber, P., León-Araúz, P., 2016. Specialized Knowledge Representation and the Parame-

terization of Context. *Front. Psychol.* <https://doi.org/10.3389/fpsyg.2016.00196>

Fafinski, M., 2020. Facsimile Narratives: Researching the Past in the Age of Digital Reproduction. *Digital Scholarship in the Humanities*. *In review*.

Fagin Davis, L., 2019. Manuscript Road Trip: Linked Data, Library Science, and Medieval Manuscripts. *Manuscript Road Trip*. URL <https://manuscriptroadtrip.wordpress.com/2019/12/02/manuscript-road-trip-linked-data-library-science-and-medieval-manuscripts/> (accessed 2020-02-19).

Feuerverger, A., Hall, P., Tilahun, G., Gervers, M., 2008. Using statistical smoothing to date medieval manuscripts, in: *Collections*. Institute of Mathematical Statistics, Beachwood, OH, pp. 321–331. <https://doi.org/10.1214/193940307000000248>

Hassner, T., Rehbein, M., Stokes, P.A., Wolf, L., 2013. Computation and Palaeography: Potentials and Limits (Dagstuhl Perspectives Workshop 12382). *Dagstuhl Manifestos 2*, 14–35. <https://doi.org/10.4230/DagMan.2.1.14>

Lowe, E.A. (Ed.), 1934. *Codices Latini Antiquiores. A Palaeographical Guide to Latin Manuscripts Prior to the Ninth Century*. Oxford University Press, Oxford.

Piotrowski, Michael, 2019. Accepting and Modeling Uncertainty, in: *Die Modellierung des Zweifels – Schlüsselideen und -konzepte zur graphbasierten Modellierung von Unsicherheiten*. Hg. von Andreas Kuczera, Thorsten Wübbena, Thomas Kollatz. Wolfenbüttel 2019. (= *Zeitschrift für digitale Geisteswissenschaften / Sonderbände*, 4). [https://doi.org/10.17175/sb004\\_006a](https://doi.org/10.17175/sb004_006a)

Topolski, J., 1984. *Metodologia historii*. Państwowe Wydawnictwo Naukowe, Warszawa.

Winslow, S.M., Schneider, G., Bleier, R., Steiner, C., Pollin, C., Vogeler, G., 2019. Ontologies in the Digital Repository. Metadata Integration, Knowledge Management and Ontology-Driven Applications, in: Barton, A., Seppälä, S., Porello, D., Nicolosi Asmundo, M., Ferrario, R., Sanfilippo, E.M. (Eds.), *JOWO 2019. The Joint Ontology Workshops. Proceedings of the Joint Ontology Workshops 2019. Episode V: The Styrian Autumn of Ontology*. Graz, Austria, September 23-25, 2019. Presented at the 1st International Workshop on Ontologies for Digital Humanities and their Social Analysis (WODHSA).

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