





# How Semantic Technologies and Spatial Networks Can Enhance Archaeological Resource Management

**James Stuart Taylor**  based on peer reviews by **Dominik Lukas**  and 1 anonymous reviewer

Yael Alef, Yuval Shafirri (2024) Cultural Significance Assessment of Archaeological Sites for Heritage Management: From Text of Spatial Networks of Meanings. Zenodo, ver. 5, peer-reviewed and recommended by Peer Community in Archaeology.

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After a thorough review and consideration of the revised manuscript titled “Cultural Significance Assessment of Archaeological Sites for Heritage Management: From Text to Spatial Networks of Meanings” by Yael Alef and Yuval Shafirri [1], I am recommending the paper for publication. The authors have made significant strides in addressing the feedback from the initial review process, notably enhancing the manuscript’s clarity, methodological detail, and overall contribution to the field of Archaeological Resource Management (ARM).

On balance I think the paper competently navigates the shift from a traditional significance-focused assessment of isolated archaeological sites to a more holistic and interconnected approach, leveraging graph data models and spatial networks. This transition represents an advancement in the field, offering deeper insights into the sociocultural dynamics of archaeological sites. The case study of ancient synagogues in northern Israel, particularly the Huqoq Synagogue, serves as a compelling illustration of the potential of semantic technologies to enrich our understanding of cultural heritage.

Significantly, the authors have responded to the call for a clearer methodological framework by providing a more detailed exposition of their use of knowledge graph visualization and semantic technologies. This response not only strengthens the paper’s scientific rigor but also enhances its accessibility and applicability to a broader audience within the conservation and heritage management community.

However, I do think it remains important to acknowledge areas where further work could enrich the paper’s contribution. While the manuscript makes notable advancements in the technical and methodological domains, the exploration of the ethical and political implications of semantic technologies in ARM remains less developed.

Recognizing the complex interplay of ethical and political considerations in archaeological assessments is crucial for the responsible advancement of the field. Thus, I suggest that **future work** could productively focus on these dimensions, offering a more comprehensive view of the implications of integrating semantic technologies into heritage management practices. I don't think that this omission is a reason to withhold the paper for publication or seek further review. In fact I think it stands alone a paper quite well. Perhaps the authors might consider this as a complementary line of inquiry in their future work in the field.

In conclusion then, I believe the revised manuscript represents a valuable addition to the literature, pushing boundaries of how we assess, understand, and manage archaeological resources. Its focus on semantic technologies and the creation of spatial networks of meanings marks a significant step forward in the field. I believe its publication will stimulate further research and discussion, particularly in the realms of ethical and political considerations, which remain ripe for exploration. Therefore, I'm happy to endorse the publication of this manuscript.

### **References:**

[1] Alef, Y and Shafirri, Y. (2024). Cultural Significance Assessment of Archaeological Sites for Heritage Management: From Text of Spatial Networks of Meanings. Zenodo, 8309992, ver. 5 peer-reviewed and recommended by Peer Community in Archaeology. <https://doi.org/10.5281/zenodo.8309992>

## **Reviews**

### **Evaluation round #1**

DOI or URL of the preprint: <https://doi.org/10.5281/zenodo.8309992>

Version of the preprint: 3

### **Authors' reply, 02 April 2024**

Dear Editor and recommender

This is an Updated Version 4 following the reviewer's comments.

We appreciate the opportunity to improve our manuscript based on the reviewers' insightful comments. We have diligently incorporated all the feedback received from the reviewers and have significantly updated our manuscript accordingly. (Therefore, the tracked changes document is not relevant)

Please let us know if you need more clarification, and we will update this letter to include detailed explanations.

Thank you for considering our revised manuscript for publication.

Sincerely,

Yael Alef and Yuval Shafirri

### **Decision by [James Stuart Taylor](#) , posted 27 November 2023, validated 27 November 2023**

#### **Recommendation for Cultural Significance Assessment of Archaeological Sites for Heritage Management in the Digital Age: From Text of Spatial Networks of Meanings by Yael Alef & Yuval Shafirri**

After reviewing the paper by authors Alef and Shafirri, I would acknowledge the significant contribution of the authors in addressing the transition from a significance-focused assessment of isolated sites to a more holistic evaluation of site values. The paper introduces the use of graph data models and spatial networks to understand

the interrelations of archaeological sites based on sociocultural parameters, providing valuable insights into the potential of contemporary technology in Archaeological Resource Management (ARM) inventories.

The authors successfully highlight the increased information gleaned from analyzing sites not only in isolation but as part of a regional set. They emphasise the positive effects on the general understanding of these sites, moving beyond a mere focus on artifact assemblages. The findings underscore the impact of utilising graph data models in archaeology, offering a more comprehensive perspective.

However, several crucial points raised by the reviewers necessitate careful consideration for the paper to attain its full potential and be recommended for publication. When considering these recommendations I would suggest the authors to consider carefully the reviewer's original comments which are broadly summarised here. **Key Areas for Revision noted by Reviewers: Broaden Focus on Ethical and Political Parameters**

- The paper should extend its focus on the ethical and political parameters inherent in assessing archaeological sites as semantic data. The inquiry into the interpretative value and potential effects on data use and re-use could be more thoroughly addressed, aligning with the authors' acknowledgment of the importance of aligning technology use with ethical principles.

#### **Contextualise Geographical Scope**

- Clarify and expand on the geographical context of the research, providing information beyond Galilee to enhance the understanding, especially for readers unfamiliar with the area. Specify the nation-state to provide a more comprehensive context.

#### **Enhance Methodological Explanation and Improve Clarity**

- Address minor issues affecting readability, such as renumbering or leaving unnumbered items for better logical flow. Clarify the 'hierarchy' of sites and emphasize the benefits of the project for the preservation and development of 'less important' sites. Remove any unclear connections to AI and NLP if not adequately addressed in the paper. Provide a clearer connection between records in the supplemental file and the graph. Introduce Arches if central to the project and ideally include the graph data, list of entities, and concept model for a more explicit presentation of the methodology.
- Pay attention also to reviewer comments on language editing, redundancy in the title, and the need for better contextualisation of the presented case study in the abstract. Emphasise the project's context within the wider exploration of digital storytelling in heritage sites and museums in the introduction. Revise terminology related to inventories for clarity. Explain CRM-related terminology for readers outside the conservation/heritage protection domain. Address specific comments on abbreviations, terminology, and references throughout the paper.

With careful revisions in these key areas, the paper has the potential to significantly contribute to the scientific literature. The synthesis of archaeological knowledge through semantic annotation and graph databases is commendable, but a more comprehensive exploration of ethical considerations and a refined contextualisation will elevate its impact. We encourage the authors to address these concerns in a revised version, ensuring the paper's readiness for publication.

#### **Reviewed by Dominik Lukas , 01 November 2023**

The paper "Cultural Significance Assessment of Archaeological Sites for Heritage Management in the Digital Age: From Text of Spatial Networks of Meanings" by Yael Alef and Yuval Shafriri discusses the changes involved in moving from a significance focussed assessment of isolated sites, to a more holistic assessment of values of sites, considering their contextual interrelations following a set of sociocultural parameters. The authors point to their stated problem of a lack of guiding principles of spatial and semantic tools in order to understand the building blocks of site values and how to implement those with contemporary technology in ARM inventories.

Throughout the paper the focus lies on highlighting the increased information, which can be gathered by analyzing sites not only in isolation but as a regional set and via using graph data-models that allow for seeing interrelations based on a predefined conceptual framework.

The increased understanding of the sites using a graph data-model are presented in the findings and the authors underscore their impact within their discussion, focussing on the positive effects for the general understanding of these sites and the increased relevance of mere artifact assemblages in relation to better known sites. While the authors are successful in examining strictly archaeological and historical data concerning the sites involved, their goal to examine the sites importance within "society's goals of cherishing and preserving historical values" is underrepresented in the text. A re-evaluation of archaeological sites as semantic data and with a perspective on "values" does not only involve scientific parameters or values strictly defined by research paradigms, but a value based approach needs to assess the breadth of semantic annotation, therefore also requiring the inquiry into the ambiguity of the interpretative value of these sites and its potential effects on the use and re-use of the same data. Although the authors underscore that it is "essential to align technology use with ethical principles," "reflect[ing] our evolving culture" when presenting their conclusions, the material actually under scrutiny in the paper does not sufficiently assess this kind of principles.

While the paper does indeed heighten the readers understand of how semantic annotation and the use of graph databases can have for archaeological knowledges, the situatedness of the contained information could still benefit from a broadened focus on those values that allow for a better understanding of the ethical and/or political parameters. It can be asumed that these parameters are known or at least knowable for the project, considering the information generally produced during the process of attempting to include a site within the UNESCO World Heritage list, as it has been the case for at least a subset of the mentioned sites.

Besides these general questions, some minor issues were identified during the review of the paper, which might impact the readability of the text:

On page 3 a subitem 1.3.1 is inserted for "The research case study," directly followed by item 2. It would help the overall logic of the text, if item 1.3.1 would be modified to 1.4 or left as an unnumbered item.

On page 3 the research scope is presented in item 2.1, yet the geographical area of research is merely indicated as Galilee, without further informing the reader on the broader geographical context. It would help the understanding of the text especially for readers unfamiliar with that area, to indicate at least the nation-state for further reference (Israel? Lebanon?).

On page 8 there is an amusing typo in the title of item 4.3, stating the "Meating" of challenges as opposed to the "Meeting" of those.

The bibliographical reference for the article by Mason (2002) indicates a doi, which unfortunately points to a different article.

## **Reviewed by anonymous reviewer 1, 23 October 2023**

It's an important and interesting project that applies Linked Data tools for creating virtual networks of heritage sites of the Roman period in the Galilee region. Connecting sites based on various narratives that bear cultural, historical and religious values for different communities is important for preserving these sites and connecting diverse groups of people. However, the written presentation of the project requires substantial improvement, including professional language editing. Title: "...in the Digital Age" – is somewhat redundant; "... From Text of Spatial Networks of Meanings" – do you mean "From Text to Spatial Networks of Meanings"? Abstract: The presented case study should be mentioned (at least in one sentence); otherwise, the abstract leaves an impression of a theoretical study. Introduction: It is unclear whether this study is a first of its kind. Yet, the idea of digital storytelling within heritage sites and museums, i.e., creating threads based on concepts, values and narratives, has been widely explored during the last 5–10 years in museology, public archaeology, and their interfaces with digital archaeology professionals. The paper would benefit from

putting the project in this context. Method: While the methodology is broadly explained, the connection between the records in the supplemental file and the graph could be more explicit. The graph data, list of entities, and concept model are also missing. If Arches is central to the project, it needs to be introduced, at least briefly. Conclusions: In the introduction, the authors mention heritage sites whose cultural value is not apparent, which leads to their neglect. But only Fig. 3 mentions a connection to a less-known site (insider knowledge). Otherwise, the 'hierarchy' of the sites is not explained, and the benefits of the project for preservation and development of the 'less important' and thus neglected sites are not emphasised. On the other hand, it is unclear how the part about AI is connected to the project and why it's mentioned at all. Same for the NLP that was not mentioned in the paper. References: All archaeological sites mentioned in the paper need an introduction or at least a reference to the major publications. All software packages used in the project need to be credited and cited. Specific comments:

- Everywhere where 'inventories' are mentioned, it should be clearer, inventories of what: heritage sites, monuments, archaeological sites, etc.
- Since the paper will be published outside the conservation/heritage protection domain, all CRM-related terminology needs to be explained or referenced.
- P. 2: "*Information-needs for ARM (In4ARM):*" – is it a standard abbreviation? If not, please explain the source or state that it's introduced here for the first time.
- P. 2: "*3) Decision-related information such as level of designation or recommendations.*" – please explain the 'level of designation'.
- Table 1: '*Semantic*' – suggest changing to 'Semantic technologies'.
- P. 3: "*The findings and discussion of this paper are based on the significance In4ARM category analytical framework.*" – the definition is unclear; previously, In4ARM was introduced as an assessment model.
- P. 3: '*The synagogues became central...*' – please explain.
- P. 3: '*... but no structural remains were located.*' – do you mean that there are no in situ/standing structures in place or that there are artefacts but no architectural fragments?
- P. 4: '*... the field was initially classified into representative samples.*' – 1. In 'field' – do you mean the 'assemblage'? 2. One can classify into classes and make a sample via sampling but not create a sample via classifying.
- P. 4: '*Cultural Assessment: First we formulated cultural assessment records for eight key sites using established methodologies.*' – please explain or refer to these methodologies.
- P.4: '*Then we used content analysis method...*' - reference is needed either to the formal content analysis method or to software, or it should be made clear that you manually analysed the content of the records, but don't mean the formal method. The same is valid for 'coding' in the following sentence.
- Table 2: 1. Please formulate what is a 'resource'; 2. The meaning of symbol <> may not be obvious to a reader;
- Table 2: '*... Mentioned in the writings of Josephus as a settlement that marks the border of the "Jewish Galilee", and correspondingly also the division into Provincia in the Byzantine period*' – 1. add ref. to J. Flavius, 2. 'provincia' is a Roman term, if you are talking about Byzantine adm. unit it's 'eparchia' or 'province'.
- Table 2: '*The Beit Midrash is part of Merot...*' – please explain what is Beit Midrash.

- Table 2: everywhere where the term 'ruin' is used: since you are talking about the cultural and other significance of the place when it was intact and functioning, the terms 'monument', 'site', 'building', etc., would be more appropriate.
- P. 3 and Table 4: "*Types of resource context components:*" – in the previous paragraph, 'context' is an entity, while here, it's presented as a composite of several entities or a concept. I suggest using another term for the 'components', for example, a 'domain'.
- Table 3: 1. Strictly speaking, it's not a table; 2. If this text is a citation from the original record, the sentence under "\*" is not part of the table but belongs to the label. If it's not a citation, then several cultural and historical terms must be explained because they are not universal.
- P. 4: '*Arches platform*' – needs a reference to the software/website.
- P. 5: '*Vadi Hamam*' – 'Wadi Hamam'.
- -Fig. 1: What is '*regional typology*'?
- P. 8: GraphDB – reference is needed.
- P. 8, footnote 2: Ariadne is not an 'archaeological oriented platform'. It's a research infrastructure. GraphDB is used by Ariadne Knowledge Base – please provide a reference/link.