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From Digital Humanities to Cultural Informatics and beyond

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Abstract

The paper discusses the field of Digital Humanities, its transition to Cultural Informatics and its dynamic evolution, incorporating different scientific disciplines and arts. Specific examples from the literature are presented, showcasing different aspects of Cultural Informatics. The future of the field is also discussed, and important considerations are raised, like the need for ethics.

Keywords

Digital Humanities, Cultural Informatics, Interdisciplinarity

1. Introduction

Working in the field of Cultural Informatics for over 20 years, I still find it difficult to explain to people outside this field what our work is all about. I usually end up describing what we do as *technologies for museums*, which is of course a very narrow aspect of what people in the field really do. Depending on the background of the people we talk to, we seem to use the terms Digital Humanities and Cultural Informatics interchangeably. Once in the company of archaeologists, the term Digital Humanities is preferred but around IT experts, the term Cultural Informatics is used. But what is the correct form, if any? Are there any differences in the use of the terms? And finally, and most importantly, what does the future hold for this truly interdisciplinary field?

2. The problem of interdisciplinarity and the Tower of Babel

To illustrate the problem of interdisciplinarity, try to imagine explaining this field to a child or someone outside academia. We are neither archaeologists and historians nor computer experts and engineers. So, it seems we do everything and nothing at the same time. Despite the potential of interdisciplinary research to bridge knowledge gaps and to assist holistic understanding of phenomena, making a real word impact by drawing on expertise from multiple fields (Kurz, 1995), there are numerous challenges like:

1. Communication issues between collaborators, since people in different fields use different methodologies and jargon. For example, when we refer to the *user*, historians, museologists, IT experts, policy makers, etc. will have a different understanding. For historians, a user is someone that visits the museum wishing to learn about the past. For museologists, a user is someone who visits a museum trying to make meaningful interpretations of objects. For IT experts, the user is the museum visitor that smoothly uses technology that enhances the quality of the visit (whatever that is, depending on different definitions). For a policy maker, a user is someone that will embrace a cultural policy, etc.
2. Issues with different methodologies, and the use of different standards, collection methods, analyses and interpretations. In a recent study focusing on the design, implementation and testing of an app for the National Gallery in London, researchers decided to use the Remind Protocol which is inspired by Clinical Psychology methodologies to provide very rich qualitative data (Kontiza et al., 2020). However, the application of the protocol in the gallery resulted in a vast number of data that was difficult to handle and interpret, showing that a methodology that works just fine in one field might be difficult to apply in another.
3. Interdisciplinary research is a group activity. This means that resources to support collaboration are needed. In addition, interdisciplinary work needs

efficient coordination, to manage the order of tasks, the time slots for collaboration, etc. In interdisciplinarity the work is group work, which means that group dynamics are powerful elements affecting the outcome of the work. In this light, efficient management of interdisciplinary teams, in essence means the handling of potential conflict points and the prevention of misunderstandings, allowing smooth collaboration between group members (Klein, 2014; Youngwerth & Twaddle, 2011).

4. Finally, traditional academic systems may not be well-suited to evaluate interdisciplinary research. This can make it difficult for researchers to get recognition and advancement for their work. For this reason, over the last years, there have been several publications trying to provide methodologies for the evaluation of interdisciplinary work (Huutoniemi, 2010; Lyall et al., 2011; Mansilla, 2006).

Thus, interdisciplinarity might feel like the Tower of Babel where people try to overcome the difficulties of working in teams of diverse backgrounds, but interdisciplinarity is not only about challenges. Working in a field that combines Cultural Heritage and Technology, implies that you never stop learning since cultural heritage is a vast domain including tangible and intangible heritage, traditions from all over the world, (hi)stories, myths and understanding of historical and social phenomena. At the same time, technology is also continuously evolving, posing new learning challenges. In addition, the work is always requiring collaboration with people from different fields, including anthropologists, historians, educators, policy makers, archaeologists, IT experts, content creators, etc. providing learning and socialization opportunities.

3. Digital humanities

The field of Digital Humanities seems to appear in the 1940s, when Roberto Busa started to think about Index Thomisticus, a concordance of Thomas Aquinas works. For doing that he had to persuade IBM to provide technical and financial support, resulting in an early computer system to support his work (Busa, 1980; 2004, Jones, 2016). In the early stages, the field involved primarily two main domains: technology and humanities (figure 1). Disciplines like history, archaeology, and literature were coupled with computer science and digital tools to study, analyze and promote cultural heritage (e.g. artifacts, texts, etc.). Digital archives emerged as a result, showing collections of cultural objects, often including functionalities for easy search.

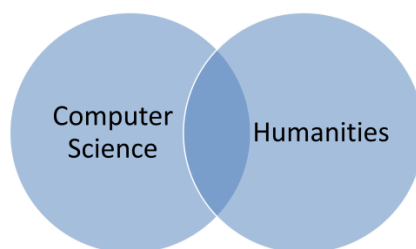


Figure 1. Digital humanities as a field to combine Humanities and Computer Science

Europeana (<https://www.europeana.eu/en>) is a known outcome of Digital Humanities projects, where items are digitized and documented, in a vast digital library of European heritage artifacts. In the Europeana database, one can find works of art like paintings, music, films, etc. as well as books, maps, photographs and more. By digitizing the cultural resources of Europe, heritage is reserved and becomes more accessible to researchers and the wider public, fostering innovation and creativity.

Similarly, in the European project CrossCult, archaeologists and IT experts worked together to create apps that revealed unknown aspects of European past, like the role of women in Ancient Greece, the importance of water to healing practices in antiquity, the difficulty of finding blue color pigments, etc. The apps were available for use in the cultural heritage sites and allowed users to access multimedia content (Lykourantzou et al., 2016; Vassilakis et al., 2016).

In a recent project (<https://digistoryteller.eu/>), historians used cutting edge technology like augmented reality and crowdsourcing tools to introduce unexplored facets of Greek history. In particular, the focus was on the events that followed the end of the Greco-Turkish war of 1922 and the refugee crisis that emerged. Stories were collected from refugee ancestors and were digitized. Historical walks were also organized across the Attica region that allowed participants to explore neighborhoods, historical events and unknown stories (Antoniou et al., 2024).

4. Cultural Informatics

A few years after the emergence of Digital Humanities as a field, and around the 1980s and 1990s it became obvious that social sciences were necessary in the field for many reasons like addressing real world needs through cultural heritage and increasing social cohesion (Li et al., 2024). Social sciences allow the identification of societal issues and suggest possible solutions (Hayek, 1943). Cultural heritage can be a valuable tool in addressing numerous contemporary societal issues and increase social cohesion. When people are connected to their past, they form a shared sense of identity and a sense of belonging in a community. In addition, heritage sites and events can be a good opportunity for the gathering of local communities and an opportunity for economic and cultural growth. In addition, cultural heritage can be a meeting place for intergenerational interaction (Li et al., 2024). The term Digital

Humanities did not seem adequate to include the social sciences and for this reason, many researchers shifted to the use of the term Cultural Informatics (figure 2).

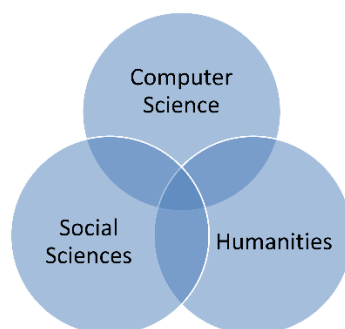


Figure 2. Cultural Informatics as a field to combine Humanities, Social Sciences and Computer Science

For example, psychologists were required for the identification of user profiles and the extraction of visitor needs, thus leading to personalized cultural content. Personalization became an important way of providing cultural content by adapting to visitors' interests, personalities, educational level, cultural backgrounds, learning characteristics, cognitive needs, etc. (Antoniou et al., 2016).

In addition, the realization that the cultural experience is also a social one, made researchers investigate ways to avoid visitors' isolation when using technology. One way to go around the problem is the use of collaborative interfaces, where visitors work together to explore the past (Katifori et al., 2020).

Social scientists were also involved in the study of visitors' emotions during the cultural experiences. Emotions are necessary for the making of long-lasting (cultural) experiences (Cahill & McGaugh, 1998). For example, European projects like Emotive (<https://emotiveproject.eu/>) investigated the role of emotions in cultural narratives. Social scientists were able to trigger emotional responses in museums, by using technologies that released specially designed sounds (Antoniou et al., 2015) and study the visitor responses at the brain level with the collection and analysis of brainwaves (Alachouzakis et al., 2018).

Visitors' interpretations of cultural content provided via technological means is also a central point in cultural informatics research. Cultural content can trigger personal reflections and allow further understanding of historical and social phenomena (Antoniou et al., 2019). Visitor interpretations can be extracted in various ways, including the analysis of visitors' comments in social media, etc. (Vassilakis et al., 2017).

Moreover, the European Union since the early 2000s decided to fund research that combined Humanities, Social Sciences and Digital Technologies. In the Horizon 2020 framework an explicit mention on social sciences and their role in cultural heritage led to the funding of various research projects and intensified research efforts in the

field. Projects like the SPICE (<https://imma.ie/whats-on/spice-partnership-research/>) directly targeted social cohesion and allowed communities to actively participate and share their cultural interpretations. The new European funding framework, Horizon Europe continues to support research that combines Humanities, Social Sciences and Digital Technologies. For example, the Open Heritage (<https://openheritage.eu/>) project combines cultural heritage and citizen science to support community engagement in preserving heritage.

5. Moving forward

But is Cultural Informatics all about Social Sciences and Humanities or other fields can be also involved? Being a truly interdisciplinary field, Cultural Informatics allows the involvement of all disciplines. For example, natural sciences and engineering can be also a vital part of the field (figure 3).

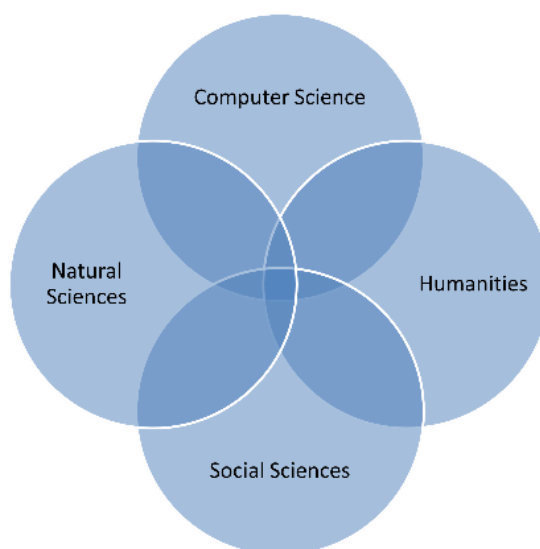


Figure 3. Cultural Informatics as a field to combine Humanities, Social Sciences, Natural Sciences and Computer Science

Think, for example, of heritage preservation studies where chemistry and engineering are actively involved. Experts use technologies to detect typical anomalies within historical structures and resistance to tremors. In addition, technology is also used to detect the different construction phases of historical buildings, etc. Apart from the obvious involvement of disciplines like chemistry and engineering, the involvement of other disciplines is also present. With the outbreak of the COVID 19 pandemic, the connection between heritage, technology, biology and medicine emerged. In March 2020 Google searches related to the Spanish flu significantly increased and people were looking into historical archives to understand the way pandemics evolved (figure 4). Thus, medicine, social medicine, biology, heritage and technology were combined to offer people answers to issues they faced in their contemporary lives.

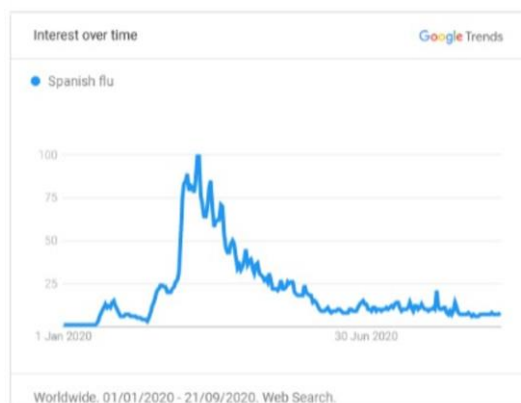


Figure 4. Google searches with the term *Spanish Flu* from 1.1.2020 to 21.9.2020

The climate challenges of the 21st century imply that disciplines like agriculture and architecture can be also a part of Cultural Informatics. Looking for sustainable ways to cultivate the earth, to create Bioclimatic buildings that respect the environment, etc. cultural heritage can provide answers. Valuable knowledge from our past can feed current research and design solutions. Following the need to respond to environmental challenges and use heritage knowledge to do so, networks like Climate Heritage (<https://www.climateheritage.org/>) were created. Despite the clear link between climate change and our cultural heritage, the Climate Heritage network explains that we are missing out on a powerful resource. A wealth of knowledge and expertise exists within the arts, culture, and heritage sectors – from archaeologists to writers, from Indigenous knowledge holders to museum curators. The network will allow us to tap into this diverse pool of talent to effectively address the climate crisis.

Hopefully, the role of natural sciences in cultural informatics is explained above, but the inclusion does not stop here. It is not only the sciences that are a part of cultural informatics, but the field is ideal from bridging sciences with the arts (figure 5).

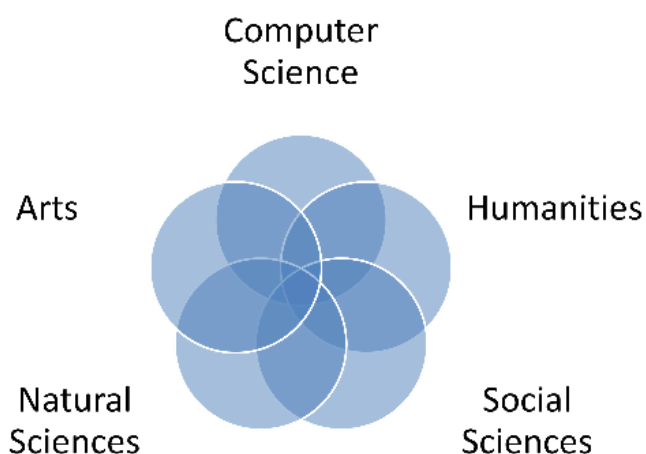


Figure 5. Cultural Informatics as a field to bridge the gap between the sciences and the arts

Graphics designers and visual artists are more frequently involved in the creation of digital cultural content. Within the concept of phygitality (the term that describes the blending of physical and digital experiences) designers and artists are actively involved. In a recent project, augmented reality was employed to reveal historical photographs from a drawing book created by graphics designers (figure 6) (Antoniou et al., 2024b).



Figure 6. Graphics design and augmented reality meeting history

Other forms of art, like music, can be also coupled with new technology. A project involving young musicians requested them to create short music clips to be placed on an archaeological route. The music was supposed to *translate* what musicians saw with their eyes into sound and thus create soundscapes for visually impaired visitors (Antoniou et al., 2023).

6. The future is here

The future of Cultural Informatics is closely linked to the development of technology. But it feels that the future is already here. The speedy developments in the field of Artificial Intelligence (AI) are influencing most aspects of science, including cultural informatics. The following examples demonstrate the penetration of AI in cultural informatics and the way our relationship with cultural heritage is rapidly and qualitatively changing.

During the COVID 19 pandemic, many online communities emerged to keep people socially connected, despite their physical isolation. Such communities often focused on local heritage. For example, there were many social media pages (e.g. Facebook) dedicated to old photos and stories of specific areas. People were invited to participate in groups about old Syros in Greece (<https://www.facebook.com/groups/118882621495335>), Athens of the past (<https://www.facebook.com/groups/251174835061036>), and sites of smaller towns like Paiania in Attica Region (<https://www.facebook.com/groups/622885641899413>) (figure 7). However, the content that was collected there was by large unstructured since every member uploaded whatever they wished and made comments often without using hashtags or other ways for easy classification of content. Nevertheless, all the uploaded information from stories to old photos and more could provide valuable information to scientists as well as locals, but in the form presented in these sites, information is chaotic and very difficult to find, extract, make connections and

create further meaning. In a recent study, Foroughi et al. (2023) used Natural Language Processing to analyze such content from the Facebook page of the city of Yazd in Iran, showing that AI can indeed provide a solution and reveal connections, sentiments, and patterns in the uploaded data.



Figure 7. Uploaded content on a local Facebook page

Museums and also cultural venues employ chatbots to introduce the cultural content. Chatbots are becoming increasingly popular since they provide interactivity and allow visitors to engage in *discussions* with the venue and the exhibits (Varitimiadis et al., 2021). Robots are also very well received by museum visitors, especially when robots can exhibit social behavior (Hellou et al., 2022).

Other impressive applications of AI use holograms to engage people with their heritage. One of the most known works, asked Holocaust survivors to remember almost their entire lives in the concentration camps and their childhood and recorded them making holograms. In addition, museum visitors could interact with the holograms and AI was used to spot the right video to answer the visitor question (Gamber, 2021). In another work, museum visitors could see holograms of Leonardo Da Vinci's machines and ask questions about them. AI was responding to their questions and provided answers (Caggianese et al., 2020).

Finally, in the near future, museums will be able to use the Internet of Things technology to create unique exhibitions and narratives. Exhibits could carry their own

metadata, self-organize and interact with other exhibits, finding commonalities between them and creating new stories (Vassilakis et al., 2018).

Conclusions

Wrapping up, the application of computing and technology in the cultural domain has allowed the emergence of an interdisciplinary domain with a very dynamic character. Digital Humanities transformed to Cultural Informatics to include Social Sciences, but this is a very restrictive way to describe the field. As shown above, the field incorporates many scientific domains and the arts, becoming ideal for bridging the gap between science and arts. In addition, Cultural Informatics feels like a safe space to experiment with new technologies and new ways to engage people and an ideal environment for interdisciplinarity, creating new methods and tools. Thus, Cultural Informatics can take science and societies further.

In doing so, however, ethical concerns can also emerge. The use of cutting-edge technology like AI, can have multiple ethics challenges, since it can reproduce biases (e.g. gender, race, etc.) (Srinivasan & Chander, 2021). Current research is realizing this aspect, and future efforts will hopefully create more bias free systems. In addition, when we make technologies for cultural heritage, it seems that we might forget underrepresented groups. Technology should be appropriate, usable and accessible by all age groups and ability levels, including people with mobility, physical sensory, intellectual, emotional, developmental disabilities, etc. (Kasemsarn et al., 2024). In addition, cultural content presented through technologies and app, should also show the lives and viewpoints of underrepresented groups, like women in antiquity, etc. (Antoniou et al., 2019). Furthermore, because technology is not a neutral medium, we need to consider issues of inequality and to what extent we are reproducing inequality or creating new types of it. Finally, Cultural Informatics can easily replace human jobs, by providing, for example, advanced and multimedia guides. Within ethic considerations, researchers could further explore how the suggested technology does not simply replace humans but created hybrid systems where humans and technology work together to create enhanced cultural experiences for visitors (Antoniou et al., 2021).

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