Taking up Artificial Intelligence as Teaching and Learning Content in the Digital Humanities – Topics, Categorisations, and Examples

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Abstract

In this article the topic of Artificial Intelligence (AI) as a teaching and learning content for the field of the Digital Humanities (DH) in higher education is examined in more detail. For this purpose, a definition of AI in the context of the DH is given first. Areas of the application of AI topics in European DH degree programme descriptions (Master and Bachelor) are scanned to show whether and how *the topic of AI is reflected in course descriptions for prospective students with a focus on Digital Humanities*. In addition to focusing the term AI, descriptions are analysed for word frequencies and existing correlations. The results show that AI is not explicitly included as a subject of study in DH course descriptions. Nevertheless, central related themes and methods are highlighted therein. Areas such as languages, literature, cultural studies, and history as well as creative and production areas that have references to digital processes and semi- and fully automated computer-aided methods are mentioned. Overall, the teaching of effective digitally supported and collaborative working methods is an essential part of the degree programs (or is aimed at in the degree program descriptions and thus in the respective degree programs), which addresses core competencies of the learners in the future working world. AI topics are finally categorised and converted into a compact overview with areas of application and two possible exemplary implementation scenarios.

Keywords: Artificial Intelligence; Digital Skills; Higher Education; Studying Digital Humanities; Teaching Digital Humanities

1   Introduction

Digital Humanities (DH) are a discipline, component, or extension of the humanities areas in combination with digital or computational processes or applications. In this sense humanities topics or areas, such as cultural studies, history, archaeology, linguistics, media studies, etc., are supplemented by computer-aided or computer-based methods. Research is data driven and based on new technologies (Liu & Ye, 2017). This means that not only the content, but also the scope of the humanities topics and fields themselves are changing and expanding. Over

time, projects became larger and more complex and the digital or information technologies became an essential part of the research process (Berry, 2011). Computer technology has thus become the actual prerequisite for thinking about questions in the Digital Humanities (Berry, 2011).

AI and big data are interconnected fields that have gained significant attention in recent years (Joshi, 2021). Areas of DH that operate with and apply AI already exist among others e.g. in the field of image analysis and restoration (e.g., Fiorucci et al., 2020; Farella et al., 2022), object recognition and classification (e.g., Bassier et al., 2020; Nockels et al., 2022), AI supported artistic expressions (e.g., Cetinic and She, 2022; Mikalonyt and Kneer, 2022) or translation, transcription, and text analysis (e.g., He et al., 2016; Nockels et al., 2022). There are also studies that examine DH courses and their content and topics to classify them (e.g., Sahle, 2013; Walsh et al., 2021; Sula and Berger, 2023).

Given the rapid development and free availability of generative AI technologies and applications in particular in the last 2-4 years, it is therefore of interest to see how the topic of AI is differentiated into teaching offerings for students (as in the DH practice AI methods exist in many ways).

In this context, Mahony et al (n.d.) point out that a curriculum in the field of DH should be mapped to survey and reflect whether current technical, scientific, humanistic, critical, and theoretical elements are included for learners (Mahony et al., n.d.). They change due to the trends and developments of the digital.

The analysis carried out here therefore deals (descriptively) with the actual inclusion of the topic of AI in DH teaching. From this perspective, the central question for the analysis described here arose: *Is the topic of AI reflected in course descriptions offered for prospective students with a focus on Digital Humanities? Is it explicitly marked as teaching content so that students can find this content from what is offered on platforms?*

2   AI in the Context of the (Digital) Humanities

Gheres and Obrad (2018) describe AI as the intelligence of machine systems and the branch of computer science that deals with their development. According to McCarthy, AI is the science and practice of creating machines and systems that exhibit intelligent behaviour similar to that of humans (McCarthy 2007, p.2). In this sense computer systems are capable of performing tasks that would typically require human intelligence (Russell & Norvig, 2021). The Cambridge Dictionary (2023) adds that this corresponds to the same way of human thinking, in terms of understanding different languages, perceiving images, or learning through experience. Furthermore, the American Heritage Science Dictionary also adds logical thinking, creativity, and the ability to make decisions based on insufficient contradictory information (2022). It could be summarised that, AI is a science and a set of computing technologies inspired by the way humans usually use their nervous system and body to perceive, learn, think, and take action (Stone et al., 2016). This refers to the development of skills such as pattern and speech recognition, decision-making, problem-solving, and learning from data (Münster et al., 2024). The *One-hundred Year Study on Artificial Intelligence* assigns increasing importance especially to machine learning technologies in particular for the interaction between humans and AI (Littmann et al., 2021) (e.g., language processing, translation, classification, clustering, speech recognition, writing assistance, image processing, generation and recognition, robotics, ethical aspects).

As awareness of AI and the use of AI continues to increase, AI-related content should ideally also be reflected in course offerings. The appropriate labelling of the teaching content in course

offerings is essential and could be a deciding factor for prospective students because Artificial Intelligence as a field of study and application can develop skills that are necessary for the later job market (e.g., OECD, 2023; Vandeweyer & Verhagen, 2020) and the combination of coding and humanities skills is often highly valued by employers (Chun & Elkins, 2023).

2.1 Monitoring DH Study Programmes as a Subject of Research

There are several studies dedicated to exploring DH as a subject in higher education. They either determine at a curricular, descriptive level which educational forms and formats exist or examine from teaching and learning practice which topics are reflected in teaching.

Sahle (2013) shows that DH teaching often focuses on a wide range of topics. There are special sub-areas (such as computational linguistics), subjects that increasingly integrate digital components (e.g. IT processes in archaeology) as well as independent courses and specialisations (Sahle, 2013). In terms of content, most teaching programmes have a reference to specialist groups, subjects or issues and contain material-related content (such as digital texts, images, or geographical information) (Sahle, 2013). Subject-specific content in DH teaching also exists but is more tied to a specific discipline and is less understood across the board (such as digital philology, text technologies or digital linguistics (Sahle, 2013)).
Sula and Berger (2023) analyse key themes addressed in DH curricula and characterise data (big data, data visualisation, projects on data or project data, data specificity for DH and data analysis), methodologies (on data in general, data and modelling approaches as well), and overarching DH topics (digital and humanities aspects in general) as inherent to the curriculum.

The authors operate on a descriptive level by analysing course offerings either through manual searches or by using course registries (as in the case of the authors the DARIAH Course Registry).

Spiro (2011) collected syllabi of DH courses and analysed more than 100. She summarises the taught key concepts in data and databases, open data and materials, copyright, networks, and interaction. Many classes focus on text data (Spiro, 2011).

In addition to the analysis of course offerings and content, it also remains to be asked which skills the DH students specifically need or use for their later professional lives. Looking at the career prospects of DH students, Walsh et al. (2021) examined in their analysis what requirements and skills students should have for a job in the DH sector. Job advertisements mention knowledge of highly technical system administration and software development, knowledge of digital research methods, and specialist knowledge in digital stewardship as required. In their analysis, the authors conclude that contents of DH-courses should be even more differentiated and provide a realistic picture of the future labour market.

These studies show that, on the one hand, there are diverse content configurations of DH study programmes, which result from the interdisciplinarity and orientation at the respective place of study. However, they also show that factors such as the labour market and professional practice are developing rapidly in this field, which requires a constant analysis of the offers, content, and possible adaptation of topics in training.

2.2 DH Study Programmes Related to AI – Data Query and Analysis Method

Descriptive considerations of offers can provide an overview of them. As part of this analysis, it was therefore decided to analyse a directory of study programme offerings. The international *studyportals* (Studyportals, 2007-2024) served as a platform for this purpose. It aggregates global offerings at different levels and enables interested students to use specific search schemes to obtain information about potential study opportunities. The analysis of such a

platform shows parallels to real situations that students are exposed to when looking for possible courses of study.

Studyportals cooperates with more than 3,750 universities and is supported by the European Commission and higher education institutes (e.g., DAAD, British Council). The platform allows to filter for bachelor's, master's and PhD offers and narrow them down according to further criteria. For this study, the focus was on Bachelor and Master offers (Bachelorsportals, 2007-2024; Mastersportals, 2007-2024). In addition, the focus was on the scope of the European continent and the degree of Arts (which usually means that the courses are located in the humanities faculties).

The data for the analysis was generated as part of a search query at the beginning of 2023 within the Bachelor and Master platform (search term Digital Humanities (or DH) and Artificial Intelligence (or AI)).

The data query resulted in a total of 1,621 offers, of which the descriptions of the respective study programmes were further analysed. These study programme descriptions were examined in more detail in R Studio. After preprocessing the text material (applying unifying operations like removing punctuation, remove stop words, stemming), descriptive statistics were applied to the corpus of course descriptions. The analysis of the occurrence of terms (absolute and relative), the analysis of correlations as well as the graphical outputs of these analyses (created in R Studio with the tm, wordcloud and ggplot packages) were carried out.

First, the occurrence of the term *AI/ Artificial Intelligence* in the descriptions of the study programmes was examined.

In a second step, two separate corpora were created out of these description texts that only contained cases with study programme descriptions that included the term *digital* and *online*. The reasons for creating two such corpora were, on the one hand, that the search query about AI did not produce any hits. On the other hand, the keyword *digital* suggests a close connection to digital data and processes that usually fall within the field of activity and processing of a digital humanist. The term *online* refers to the topic of virtual teaching and learning environments as well as the processing of objects or (arti)facts represented and to be represented online (digitisation and accessibility of cultural heritage), which could also fall into the potential future field of work of humanities students. From these corpora, the most frequently occurring terms were analysed and visualised.

Another focus was on the analysis of correlations, i.e. terms that often appear in combination with one another and can thus provide insights into connections. Correlation coefficients whose magnitude is between 0.7 and 0.9 indicate variables that can be considered as significant and indicate a positive relationship between them (Boslaugh & Watter, 2008). Terms that correlate highly can therefore be viewed as relevant for the respective corpus.
The correlations were calculated in the respective corpora, whereby they had to assume a correlation coefficient of at least or more than 0.7.

2.3 Results

Of the 1,621 cases, that were issued in response to the search query, 999 can be assigned to a bachelor's degree programme and 622 to a master's degree programme (since they are declared that way on the platforms).

*Figure 1: Number of study programmes issued with respective degree level (absolute and relative frequency)*
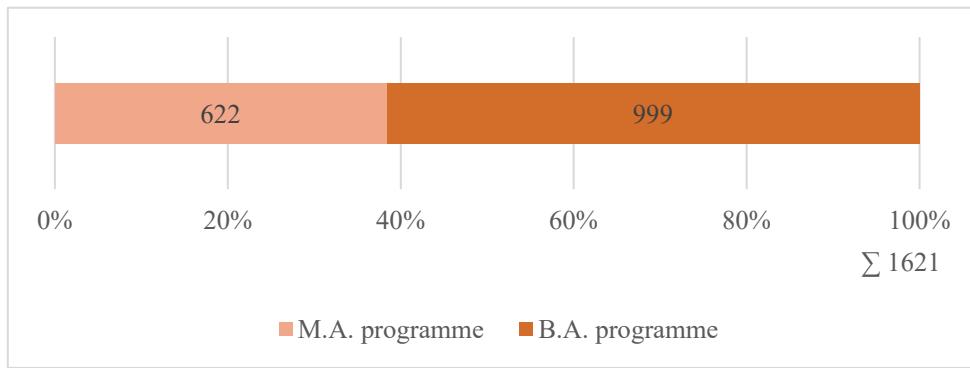
Of these 1,621 offers, the respective content descriptions of the programmes were examined for the term *Artificial Intelligence* (and/or *AI*). Searching the programme descriptions did not produce any hits.

The most common topics addressed within the programme descriptions are highlighted in the word cloud below (Figure 2). Terms that appeared more frequently are shown larger here.

Figure 2: Word cloud with the most common words; Basis: all programme descriptions
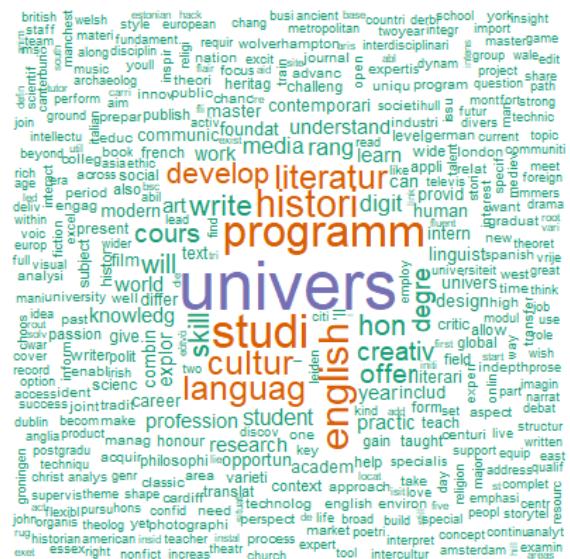
In the corpus *digital* (corpus of programme descriptions that contain the keyword digital) the most frequently occurring terms were considered (occurrences ≥ 90, Table 1). 245 programme descriptions were identified that contained the keyword digital and in which the following terms appeared most frequently.

Table 1: Most frequent words (stemmed) in the corpus digital, ≥ 90 occurrences

word	digit	univers	studi	programm
occurrence	265	200	135	123
word	cultur	media	art	
occurrence	115	96	93	

Also, a minimum occurrence of 50 was evaluated (Figure 3) and transferred into a word cloud that visualises the most frequent words.

Figure 3: Occurrences of the most frequent terms in the corpus digital (absolute frequency, min. 50 occurrences)
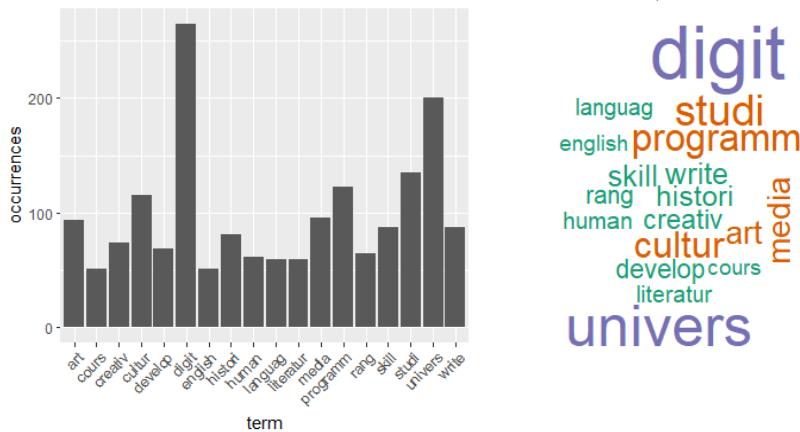
Source: Authors` representation

As described above within the corpus *digital* some terms were focused on to examine them for their correlations. The focus here was on the terms *competence*, *programming*, *skills,* and *future*, as they play an important role in digital teaching and learning processes.

Here only the term *future* has correlation coefficients equal to 0.7 with the terms *adapt*, *effort*, *higher*, *increas*, *local*, *multicultur*, *respons* and *sustain*.

In the corpus *online* (corpus of programme descriptions that contain the keyword online) the most frequently occurring terms were considered (occurrences ≥ 16, Table 2). 31 programme descriptions were identified that contained the keyword online and in which the following terms appeared most frequently.

Table 2: Most frequent words (stemmed) in the corpus online, ≥ 16 occurrences

word	online	literatur	english	work	write	culture	rang	studi	resourc
occurrence	50	27	18	18	17	16	16	16	16

Source: Authors` representation

Figure 4: Occurrences of the most frequent terms in the corpus online (absolute frequency, min 16 occurrences)
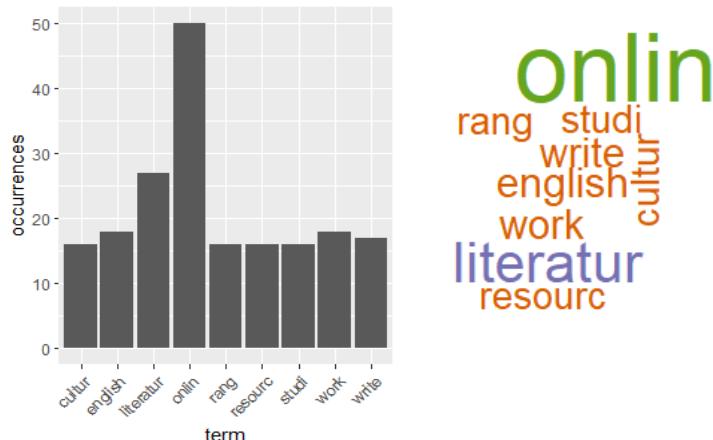
Source: Authors` representation

When calculating the correlations, it must be considered that the *online* corpus has fewer cases than the *digital* corpus. These cannot be directly compared with each other. For the purposes of the analysis, the terms *learning* and *working* were examined for their correlations, as these are related to the topic of online learning and the digitalised world of work.

It turns out that *learning* has great correlations (0.88) with the terms *collabor*, *dual, Edinburgh, fiction, hill, napier, novelworthi, oncampus, Pennsylvania, popular, set, seton, two,* and *university*.

The term work has a correlation of 0,91 with *access*, 0,8 with *onlin* and 0,7 with *abl, atlant, attend, campus, deliv, facility, fulli, group, hons programm, lectur, live, mean, particip, project, require, student, support, university* and *wider*.

2.4 Interpretation of the Data Obtained

The main result about the question raised at the beginning is that course descriptions tended to focus less on the explicit mention of AI or AI-related components. This does not mean that these are not covered or explained in more detail in the individual module descriptions. It should also be noted that some of the descriptions may have been adjusted since data collection (January 2023). Over the course of 2023, many new courses and offers on the topic of AI have been created (e.g., Digital Humanities and Artificial Intelligence at University Leiden since September 2023: https://eduxchange.nl/for-students-ul/catalog-ul/minors/digital-humanities-and-artificial-intelligence_77b6dcac-e2e2-4583-8d2b-e9bd3193503a, training courses like Artificial Intelligence and Art in 2024 at nodecenter: https://nodecenter.net/course/AI-and-art or summer courses like Art and Artificial Intelligence at TAI Madrid in 2024: https://taiarts.com/en/Summer-courses/artificial-intelligence-art/).

It becomes clear that when looking at all programme description texts reference is made to the university institution as well as to the individual disciplines that work with methods or topics of the Digital Humanities or within which digital processes are located. It is primarily languages, literature, cultural studies, and history as well as creative and producing areas such as text production or media processing.

In the corpus *digital*, the terms *digit, univers, studi* and *programm* as well as the keywords *cultur, media* and *art* play an important role (Table 1). The terms *digit* and *univers* are important because they are almost inevitably mentioned in the programme descriptions when it comes to DH. The term *program* (here in the stemmed form) also arises from the fact that the corpus is compiled from the descriptions of the study programmes themselves. However, programming can also be hidden here as a process of computer-aided methods and thus as a field of practice in DH. *Cultur*e represents the central (investigative) subject in the humanities. The digitalisation of culture and cultural heritage is accompanied by computer-aided methods and instruments. This also goes hand in hand with the fact that *media*, media representations and the processing of culture into media products and formats are objects of the Digital Humanities. Media are the essential formats and forms in which the object of study of DH (culture) is created, processed, analysed, or produced, whether digitised or completely digitally born. *Art* as an important branch of the Digital Humanities uses digital methods and processes. The fine arts in particular (architecture, sculpture, painting, drawing, graphics and photography as well as handicrafts) operate with digital research, reconstruction, or creation.

Correlations can provide information about the extent to which there are significant relationships between some terms and related topics. Several terms were queried in the corpus *digital*, but only the term *future* seems to have significant correlations with other terms and establish a meaningful connection with the research question. The term has a correlation coefficient of 0.7 with the terms *adapt, effort, higher, increase, local, multicultur, respons* and *sustain* and therefore a significantly high and positive association with them. The terms *adapt, increase,* and *sustain* could be an indication that the existing competencies and skills of the students are further expanded and sustainably consolidated during their studies and therefore point to a promotion of the students' competencies within the DH study programmes and

through the respective course offerings. A strong focus on future skills seems therefore inherent in some DH curricula and offers, which is a hallmark of innovative and modern educational understandings (OECD, 2016). The term *higher* refers to higher education.

*Multicultur*al and *local* can be viewed as a kind of contact or reference points that make the object of study of DH (culture) more locally tangible. The connection to *local* culture is always an important criterion for DH courses, as collaboration with cultural institutions in the respective environment and, if necessary, the existence of a certain cultural or historical relevance of places or regions, offers a practical identification point for research with and about culture (Al Akel & Sharif, 2024; Nared & Bole, 2020). The same applies to the term *multicultur*e, which indicates that cross-regional cultural materialities and imaterialities are relevant as an object of study in DH. It extends spatial centring to international and global reach and influences (Gnecco, 2015; e.g., CIVIS, 2024). For students, these contexts can indicate an orientation of the DH course content towards local and multicultural aspects and interest groups, which induces a diversity of research into culture and cultural heritage.

In the corpus *online*, the most common terms *literature*, *English* and *work* are particularly interesting (Table 2). The appearance of these terms could indicate that courses that deal with literature or English are increasingly working with online tools or online text data, be it for analysis (e.g. analysing text data from online databases) or for creating own literary texts (e.g. writing and publishing literary texts for websites or blogs). The computer-aided research of language and text has long been an independent research area (e.g., Computational Linguistics since the 1950ies (Britannica, 2021) or NLP (Natural Language Processing) from the 1904ies onwards (Stanford, 2004)) and implies that established methods for text analysis and processing from these areas are used for research in the Digital Humanities branches that focus on texts (Hiippala, 2021; McGillivray et al., 2020).

Furthermore, the term *work* as a prominent word in the online corpus could imply that online skills (e.g. the use of web technologies) are viewed as essential for Digital Humanities students for their later professional lives.

To analyse the correlation coefficients, the terms *learn* and *work* were queried as potential correlation units. It turns out that within this *online* corpus *learn* has great correlations (0,88) with *collabor, dual, fiction, hill, napier, novelworthi, oncampus, popular, set, seton, two*, and *university* (locations were not considered).

*Collabor*ation is an essential skill, particularly in virtual and digital (project) work (e.g., Dittes & Smolnik, 2019), which the course descriptions examined also take up, be it in the way that this competence is discussed during the course of study or in the way in which it is perceived by the programme developers as essential for the future professional field and is therefore named in the course descriptions.

The term *dual* is also worth taking a closer look at. Dual study programmes in Europe (e.g. Information Processing at University of Cologne, 2024) enable students to study part-time at bachelor's or master's level. Learners can combine practical experience with theoretical and methodological knowledge and apply it directly in a humanities-related field. Dual could also mean that the subject area of the courses offered is made up of the areas of the "classical" humanities and the more mathematical-informational domains.

When analysing the term *work* for its correlations, it is noticeable that the term *access* assumes a particularly high value (of 0,91). Furthermore, *work* correlates with a coefficient of 0,8 with *onlin* and 0,7 with *abl, atlant, attend, campus, deliv, facility, fulli, group, hons programm, lectur, live, mean, particip, project, require, student, support, university* and *wider*.

The very high correlations between *work* and *access* could be an indication that digital and online skills are an essential prerequisite for entering tomorrow's labour market (e.g., van`t Noordende & Scarpetta, 2022). The correlation could also be interpreted to mean that online access is seen as a prerequisite for students who enrol in the respective course of study to be able to work effectively during their studies.

Online further indicates that the potential work of DH students can and will be online-based or mediated.

The terms whose correlation coefficients are 0.7, on the other hand, could focus more on the implementation or process of studying itself and aim at different working models within it. For example, the term *project* could be aimed at project work, which serves as a testing ground for working with culture in many DH study programmes. The term *group* could also refer to working models that are group-related and practice-oriented and thus in turn strengthen collaboration among each other.

2.5 Implications for AI Related DH Teaching

It should be noted that the course descriptions that served as the basis for the analysis primarily reflect the normative aspects and requirements for prospective students of the respective offerings. The extent to which these requirements are reflected in individual courses or are perceived as such by the learners themselves must be examined in further analyses.

However, the question about the differentiation of the topic of AI as content in DH course descriptions can be answered by saying that it had not yet been sufficiently addressed at the time the data was collected. Students who were explicitly looking for a training opportunity that linked AI topics with the humanities at the time were unable to find what they were looking for in this context.

It is important that course providers ensure that the course content is adequately described in the course texts. Especially when it comes to getting an overview of offers, interested parties will not search through every offer in more detail. It is therefore also important to highlight whether there is specific AI-related training content, as dealing with these topics and thus the opportunity to develop AI-related skills could be seen as an advantage of digital humanities courses (Leibler, 2022). The associated better positioning on the later job market can influence the decision to study.

Potential AI topics can be combined with existing topics in the DH programmes. Huang, Li, Zhu, and Nie show that AI technologies for learning purposes with reference to humanities data are primarily focused on subjects such as history, library science, and linguistics (Huang & Li, 2020; Zhu & Nie, 2016). These could be expanded to other areas (for example, through approaches that apply methods such as classification or clustering to works by artists or create generative technologies for the creation of works based on data from specific artists or epochs). In the research of cultural heritage, for example, topics that are related to AI could be integrated, too (e.g., operating with cultural heritage data, experience, or audience engagement activities (Pasikowska-Schnass and Lim, 2023)). Generative approaches can also be used in media and media production, which could, for example, support the creation of own media and digital products.

When using AI-supported technologies, the reflective aspect is also essential, which can be taken up and integrated through practical and project-oriented teaching. Participating learners can experience and evaluate this directly through their own practical work. Since cooperation is an important keyword in the data analysed, these cooperative structures can be used to create project- and practice-oriented formats that include AI as a topic.

The question of a generally valid structuring of the topic of AI in DH certainly cannot be answered in general terms. This is also complicated by the fact that there are few applicable guides summarising common or mainstream AI-based approaches to the humanities (Mäkelä, n.d.). This in turn has an impact on teachers and their concepts for AI topics in DH lessons. In this context, Mäkelä (n.d.) points out that teachers are initially faced with the challenge of creating learning resources that illustrate AI using real-world topics or questions in the humanities and further make them understandable to learners using concrete humanities data. Different levels of data abstraction typically require different approaches to teaching. O (2016), Zhang et al (2021) and Zhang and Wang (2021) show in this context that teaching approaches are mainly concerned with data collection, processing, classification and dissemination, possible and future-relevant methods for applying artificial intelligence in the humanities (e.g. machine learning, deep learning) are hardly covered (Ye, 2022). A new direction of artificial intelligence also includes data intelligence, cross-media artificial intelligence and human-machine association intelligence (they are particularly suitable for research into intangible cultural heritage) (Ye, 2022).

Sharing materials and proven teaching concepts can inspire other teachers in the field to integrate AI into their courses. In addition, increased collaboration between teachers and a mentality of exchange can further promote the use of AI in DH teaching.

The rapid further development of AI and the associated diverse applicability to humanities data and contexts not only poses challenges for the development of adequate learning materials but must also consider the diverse subject background of students in the Digital Humanities area.Ghereş and Obrad (2018) deal with the existing dispositions of students and highlight clear differences in the basic level of information and knowledge about AI between students in technical and humanities courses. According to their research, technical graduates themselves had a more comprehensive understanding of the application and use of AI. Humanities students, on the other hand, would pay more attention to the human aspect behind the technologies. This also means that AI developments are judged more reflexively in connection with social developments (economy, military conflicts, negative effects on interpersonal relationships, changes in the labour market, ...) rather than generally wanting to apply them yourself. Such a perspective on AI may not necessarily be detrimental, but it should be taken into account when developing learning materials to promote AI-based skills.

Overall, the need for AI-related topics in DH courses seems to have been partially recognised and taken up by science (Chun & Elkins, 2023). Here too, AI can be seen as a driver to advance the creation and distribution of teaching and learning materials. As computational methods and processes themselves are becoming increasingly automated, more and more digital humanists will be able to use computational approaches, code, and statistical methods for DH research, and being able to understand and comprehend the underlying concepts in a self-directed manner (Chun & Elkins, 2023).

3   Categories and Examples of Applicating AI in the Teaching Context of DH

With reference to the results obtained and existing findings from research on DH and AI teaching and learning topics (Gefen et al., 2021; Mäkela, n.d.; Münster et al., 2024), the following graphic can be derived, which summarises and categorises potential areas of use of AI in the DH.

Figure 5: Derived categorisation: *Areas of DH in which AI is or can be implemented*
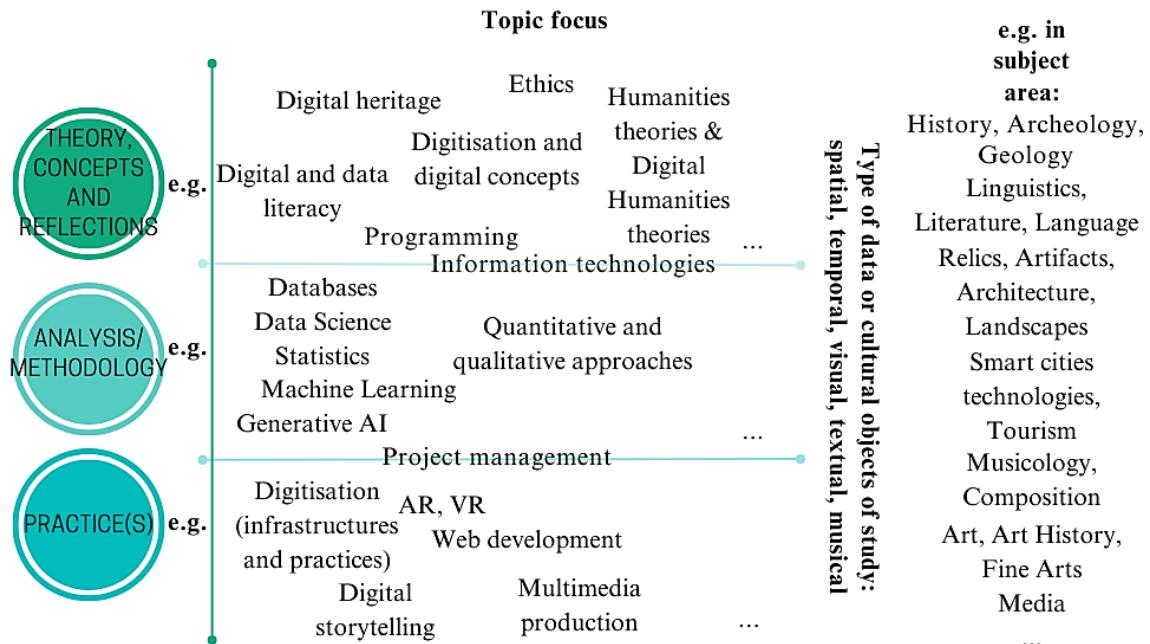
Source: Authors` representation

Within these categories and subject areas, teaching scenarios can be enriched with AI tools or applications in varying degrees of differentiation. This certainly always depends on the respective area (see Figure 5, on the right) or, if it is an overarching DH course offering, on the focus, which is given either by the teachers, their research background, and associated courses or by possible choice behaviours on the part of the learners. Table 3 focuses two selected topics from the graphic (Figure 5) and provides a more detailed breakdown of the didactic aspects that may need to be considered when teaching students in one of these. For interested teachers, the references to the resources can also serve as a further source of ideas.

Table 3: Possible implementations of DH and AI related topics in teaching-learning scenarios

Area and topic	Possible implementations in a teaching-learning scenario	Areas of application for AI tools or topics	Resources for teachers
Media: Digital stories and virtual events	Use of the flipped-classroom model to provide theoretical and practical input on the topic and implementation, as well as to allow practical phases in which the participants themselves produce elements of digital stories or virtual events and then put them up for discussion. Go into the areas of existing examples and elements for creation. For example: music and spoken words, text, images, moving images, integration into websites or for virtual curation purposes; or virtual event concepts, virtual venues, technical infrastructure on the part of artists and	Use generative AI tools to generate ideas for stories or events. Have sample dialogs or concepts displayed and encourage participants to critically question the output. Use https://chat.openai.com/ as a starting point. Start looking at the engagement of your (potential) users and create even more appropriate content. To do this, use AI-based analysis methods that are active on your website or during your virtual event.	Robin (2016). The Power of Digital Storytelling to Support Teaching and Learning: https://www.researchgate.net/ publication/311964446_The_P ower_of_Digital_Storytelling_ to_Support_Teaching_and_Le arning The Alberta Teachers Association (2020). Resources for Digital Storytelling: https://teachers-ab.libguides.com/educationalt echnology/digital_storytelling James Madison University (2024). Storytelling tools and student examples: https://www.jmu.edu/digicom m/resources/storytelling.shtml

Area and topic	Possible implementations in a teaching-learning scenario	Areas of application for AI tools or topics	Resources for teachers
	viewers, or participation opportunities. Let participants experiment with creating elements of a story or event themselves. Offer discussion and reflection sessions. Offer that the stories created are published or that the designed events are implemented (e.g. as part of cooperation with cultural institutions or actors; on different media channels; on platforms or in the metaverse).	Use https://analytics.google.com and/or get familiar with the opportunities of it: https://analytics.google.com/analytics/academy/	Ramely et al. (2021). Virtual is Vital: The Strategies, Design, and Attendee Engagement of Virtual Events: https://www.researchgate.net/publication/356909917_Virtual_is_Vital_The_Strategies_Design_and_Attendee_Engagement_of_Virtual_Events Lautamäki & Tikkaoja (2022). Planning and Creating virtual events: https://www.humak.fi/wp-content/uploads/2022/04/planning-and-creating-virtual-events-2022-vevent.pdf
Literature: Data analysis	Design a practice-oriented course that introduces the concepts of close and distant reading (Bode, 2017) and initially deals with text data and data structures. Then choose an application scenario on which you want to demonstrate data analysis. This can be, for example, texts from one or more authors on a specific topic. Also briefly introduce statistical principles and simple procedures so that participants understand calculating large amounts of data. Then focus on simple metrics, such as frequency analyses in digital data, and present evaluation methods. Visual evaluations in particular can make the importance of data science clear to participants. For example, word clouds or diagrams with frequency distributions can be created. Provide all performed procedures, for example in the form of Jupyter-Notebooks, scripts or explained documents. Ask the participants to follow this and set a task in which the same procedures are to be carried out with specially selected data.	Go deeper into Machine Learning approaches. Choose supervised or unsupervised approaches and demonstrate step by step how the algorithms operate. Wachowiak (2022). Machine Learning in the Digital Humanities. https://ecampusontario.pressbooks.pub/nudh2/chapter/machine-learning-in-the-digital-humanities/ For example, use Named Entity Recognition or the Naïve Bayes Classifier to classify data to clarify the procedures. Stanford NLP Group (2020). Named Entity Recognition. https://stanfordnlp.github.io/CoreNLP/ner Ehrmann et al. (2021). Named Entity Recognition and Classification on Historical Documents: A Survey: https://arxiv.org/pdf/2109.11406.pdf Watanabe & Müller (2023). Quanteda Tutorials; Machine Learning; Naïve Bayes Classifier: https://tutorials.quanteda.io/machine-learning/nb/	McGillivray et al. (2020). The challenges and prospects of the intersection of humanities and data science: A White Paper from The Alan Turing Institute: https://www.turing.ac.uk/sites/default/files/2020-08/humanities_and_data_science_white_paper_-_updated.pdf Karsdorp et al. (2022). Humanities Data Analysis: Case Studies with Python: https://www.humanitiesdataanalysis.org/ Also see Harvard (n.d.) D+ART+H Resources for tools and digital methods for analysis: https://digitalhumanities.fas.harvard.edu/resources/choosing-digital-methods-and-tools/ Watanabe & Müller (2023). Quanteda Tutorials; e.g. Basic operations https://tutorials.quanteda.io/basic-operations/ or statistical analysis https://tutorials.quanteda.io/statistical-analysis/

Source: Authors` representation

4   Conclusion

The article summarised what is meant by AI and how it can be understood, particularly in relation to the (Digital) Humanities. In existing course descriptions of DH offerings, the representation of AI topics within the curriculum was considered. The data was based on a query from 2023 and resulted in few insights regarding the explicit naming and labelling of AI as a study component. However, such a breakdown is particularly important for potential students, as the acquisition of AI skills for humanities scholars can certainly be perceived as an advantage in the future career market.

In addition, it has emerged that digital and computer-aided elements and procedures are already mentioned in the course descriptions as concrete components of DH courses. Associated, transformed working methods that are collaborative, project-related or based on teamwork are also specifically mentioned in course descriptions. A reference to concrete AI applications and processes as a teaching-learning component within the framework of humanities offerings, which was still missing at the time of examining the generated data, could nevertheless be relevant for the currently developing area of AI-DH. Only through learning resources that work with humanities data and use AI methods can students gain a long-term understanding and application perspective for their (own) humanities research or projects and thus develop valuable skills for the future.

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References

Al Akel, A. & Sharif, M.M. (2014). Turning tourism into development: Mitigating risks and leveraging heritage assets. [Online]. Available: https://www.weforum.org/agenda/2024/02/turning-tourism-into-development/

American Heritage Science Dictionary. (2022). Artificial Intelligence. [Online]. Available: https://ahdictionary.com/word/search.html?q=Artificial+intelligence

Bachelorsportal. (2007-2024). Bachelor study programme offers. [Online]. Available: https://www.bachelorsportal.com/search/bachelor?utm_source=studyportalsweb&utm_medium=organic&_gl=1*alacq2*_ga*NTM1OTYxNzA0LjE3MDcxMjg2OTc.*_ga_5NRBVTZ70K*MTcwNzEyODY5Ny4xLjEuMTcwNzEyODczMS4wLjAuMA..

Bassier, M., Bonduel, M., Derdaele, J. and Vergauwen, M. (2020). Processing existing building geometry for reuse as Linked Data. *Automation in Construction*, 115. Pp. 103-180.

Berry, M. (2011). The computational turn: Thinking about the Digital Humanities. *Culture Machine*, Vol. 12 2011 https://culturemachine.net/wp-content/uploads/2019/01/10-Computational-Turn-440-893-1-PB.pdf

Bode, K. (2017). The Equivalence of "Close" and "Distant" Reading; or, Toward a New Object for Data-Rich Literary History. *Modern Language Quarterly*, 78 (1). Pp. 77–106. https://doi.org/10.1215/00267929-3699787

Britannica, T. (2021). *C*omputational linguistics. [Online] Available: https://www.britannica.com/science/computational-linguistics

Cambridge Dictionary. (2023). Artificial Intelligence. [Online]. Available: https://dictionary.cambridge.org/dictionary/english/artificial-intelligence

Cetinic, E. and She, J. (2022). Understanding and Creating Art with AI: Review and Outlook. ACM Trans. *Multimedia Computing, Communications, and Applications*, 18. Pp. 1–22.

Chun, J. and Elkins, K. (2023). The Crisis of Artificial Intelligence: A New Digital Humanities Curriculum for Human-Centred AI. *International Journal of Humanities and Arts Computing.* Volume 17/ 2. Pp. 147-167. DOI: 10.3366/ijhac.2023.0310

CIVIS. (2024). Multiculturalism and cultural heritage - Rediscovering, telling and sharing the visual imprints and fragments of the metamorphosis. [Online]. Available: https://civis.eu/en/learn/civis-courses/multiculturalism-and-cultural-heritage-rediscovering-telling-and-sharing-the-visual-imprints-and-fragments-of-the-metamorphosis

Dittes, S. and Smolnik, S. (2019). Towards a digital work environment: the influence of collaboration and networking on employee performance within an enterprise social media platform. *J Bus Econ.* 89. Pp. 1215–1243.

Farella, E.M., Malek, S. and Remondino, F. (2022). Colorizing the Past: Deep Learning for the Automatic Colorization of Historical Aerial Images. *J. Imaging*, 8, 269.

Fiorucci, M., Khoroshiltseva, M., Pontil, M., Traviglia, A., Del Bue, A. and James, S. (2020). Machine Learning for Cultural Heritage: A Survey. *Pattern Recognition Letters*, 133. Pp. 102–108.

Gefen, A., Saint-Raymond, L. and Venturini, T. (2021). AI for Digital Humanities and Computational Social Sciences. In: B. Braunschweig & M. Ghallab (eds.). Reflections on AI for Humanity. Springer: Heidelberg. Pp. 191-202. DOI: 10.1007/978-3-030-69128-8_12

Gheres, V. and Obrad, C. (2018). Technical and Humanities Students' Perspectives on the Development and Sustainability of Artificial Intelligence (AI). *Sustainability*, Vol. 10(9), Article 3066. [Online]. Available: https://doi.org/10.3390/su10093066

Gnecco, C. (2015). Heritage in Multicultural Times. *The Palgrave Handbook of Contemporary Heritage Research.* London: Palgrave Macmillan. Pp. 263-280. DOI: https://doi.org/10.1057/9781137293565_17

He, S., Samara, P., Burgers, J. and Schomaker, L. (2016). A multiple-label guided clustering algorithm for historical document dating and localization. *IEEE*, 25, 11. Pp. 5252–5265.

Hiippala, T. (2021). Applied Language Technology: NLP for the Humanities. *Proceedings of the Fifth Workshop on Teaching NLP*, June 10–11, 2021. Association for Computational Linguistics. Virtual. Pp. 46–48.

Huang, C. and Li, J. X. (2020). Analysis of the current situation of Qinghai intangible cultural heritage protection under the background of the Internet era and the idea of digital protection. *Inner Mongolia Science and Technology and Economy*. Volume 16. Pp. 87-89.

Joshi, A.V. (2020). *Machine Learning and Artificial Intelligence*, Cham: Springer.

Leibler, Y. (2022). The Information Revolution Put Tech Disciplines at the Center - But Now It Needs the Humanities. [Online] Available: https://www.entrepreneur.com/science-technology/why-the-rise-of-ai-requires-revitalizing-the-humanities/431241

Littman, M.L., Ajunwa, I. Berger, G., Boutilier, C., Currie, M., Doshi-Velez, F., Hadfield, G., Horowitz, M.C., Isbell, C., Kitano, H., Levy, K., Lyons, T., Mitchell, M., Shah, J., Sloman, S., Vallor, S and Walsh, T. (2021). Gathering Strength, Gathering Storms: The One Hundred

Year Study on Artificial Intelligence (AI100). Study Panel Report. Stanford University, Stanford, CA. [Online]. Available: http://ai100.stanford.edu/2021-report

Liu, W. and Ye, Y. (2017). Discussion on the technical system and theoretical structure of digital humanities. *Chinese Library Journal*. Volume 43(5). Pp. 32-41. https://doi.org/10.13530/j.cnki.jlis.170020

Mahony, S., Fu, Y. and Liu, B. (n.d.). Digital Humanities Curriculum Development: an iSchools Approach. [Online] Available: https://discovery.ucl.ac.uk/id/eprint/10155472/2/DH-CurriculumDesign.pdf

Mastersportal. (2007-2024). Master study programme offers. [Online]. Available https://www.mastersportal.com/search/master?utm_source=studyportalsweb&utm_medium=organic&_gl=1*ibxxyo*_ga*NTM1OTYxNzA0LjE3MDcxMjg2OTc.*_ga_5NRBVTZ70K*MTcwNzEyODY5Ny4xLjEuMTcwNzEyODczMS4wLjAuMA...

Mäkelä, E. (n.d.) (all) the (different) Digital Humanities. Aalto University School of Science. [Online] Available: http://j.mp/allthedh

McCarthy, J. (2007). What is AI? [Online]. Available: http://www-formal.stanford.edu/jmc/whatisai.pdf

McGillivray, B., Poibeau, T. and Fabo, P.R. (2020). Digital Humanities and Natural Language Processing: "Je t'aime... Moi non plus". *Dhq*, Vol 14/ 2, 1-45.

Mikalonyté, E.S. and Kneer, M. (2022). Can Artificial Intelligence Make Art?: Folk Intuitions as to whether AI-driven Robots Can Be Viewed as Artists and Produce Art. *ACM Transactions on Human-Robot Interaction* (THRI), 11, No. 4.

Münster, S., Maiwald, F., di Lenardo, I., Henriksson, J., Isaac, A., Graf, M.M., Beck, C. and Oomen, J. (2024). Artificial Intelligence for Digital Heritage Innovation: Setting up a R&D Agenda for Europe. *Heritage*. 7. Pp. 794-816. https://doi.org/10.3390/heritage7020038

Nared, J. and Bole, D. (2020). Participatory Research on Heritage- and Culture-Based Development: A Perspective from South-East Europe. *Participatory Research and Planning Practice.* Cham: Springer Open. Pp. 107-120.

Nockels, J., Gooding, P., Ames, S. and Terras, M. (2022). Understanding the application of handwritten text recognition technology in heritage contexts: A systematic review of Transkribus in published research. *Archival Sciences*, 22. Pp. 367–392.

OECD. (2016). *Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills*, Paris: OECD Publishing. DOI: http://dx.doi.org/10.1787/9789264265097-en

OECD. (2023). AI and the Future of Skills. Volume 2: Methods for Evaluating AI Capabilities. Educational Research and Innovation. OECD Publishing: Paris. [Online]. Available: https://doi.org/10.1787/a9fe53cb-en

O, Y. J. (2016). Visual analysis and mining of large-scale ancient texts for digital humanities research. *Chinese Library Journal*. Volume 42(2). Pp. 66-80. https://doi.org/10.13530/j.cnki.jlis.160011

Passikowska-Schnass, M. and Lim, Y-S. (2023). Artificial intelligence in the context of cultural heritage and museums. Complex challenges and new opportunities. [Online]. Available: https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/747120/EPRS_BRI(2023)747120_EN.pdf

Russell, S.J. and Norvig, P. (2021). *Artificial Intelligence. A Modern Approach*, Indianapolis: Pearson Education.

Sahle, P. (2013). DH study! Towards a core and reference curriculum for the Digital Humanities. [original title: DH studieren! Auf dem Weg zu einem Kern- und Referenzcurriculum der Digital Humanities.] [Online] Available: http://webdoc.sub.gwdg.de/pub/mon/dariah-de/dwp-2013-1.pdf

Schnapp, J. and Presner, P. (2009). Digital Humanities Manifesto 2.0. [Online]. Available: http://www.humanitiesblast.com/manifesto/Manifesto_V2.pdf

Spiro, L. (2011). Knowing and Doing: Understanding the Digital Humanities Curriculum. [Online]. Available: https://digitalscholarship.files.wordpress.com/2011/06/spirodheducationpresentation2011-4.pdf

Standford. (2004). Natural Language Processing. [Online]. Available: https://cs.stanford.edu/people/eroberts/courses/soco/projects/2004-05/nlp/overview_history.html

Stone, P., Brooks, R., Brynjolfsson, E., Calo, R., Etzioni, O., Hager, G., Hirschberg, J., Kalyanakrishnan, S., Kamar, E., Kraus, S., Leyton-Brown, K., Parkes, D., Press, W., Saxenian, A.L., Shah, J., Tambe, M. and Teller, A. (2016). Artificial Intelligence and Life in 2030. One Hundred Year Study on Artificial Intelligence: Report of the 2015-2016 Study Panel, Stanford University, Stanford, CA. [Online]. Available: http://ai100.stanford.edu/2016-report

Studyportals. (2007-2024). Study programme research. [Online]. Available: https://studyportals.com/students/

Sula, C.A. and Berger, C. (2023). Training Information Professionals in the Digital Humanities: An Analysis of DH Courses in LIS Education. *College & Research Libraries*, 84/5. Pp.802-823.

University of Cologne. (2024). Information Processing, Bachelor of Arts. [Online]. Available: https://studienorientierung.uni-koeln.de/range_of_courses/index_eng.html?app=true&id=12

Vandeweyer, M. and Verhagen, A. (2020). The changing labour market for graduates from medium-level vocational education and training. *OECD Social, Employment and Migration Working Papers*, No. 244. Paris: OECD Publishing. [Online]. Available: https://doi.org/10.1787/503bcecb-en

Van`t Noordende, S. and Scarpetta, S. (2022). Digital skills: How businesses and policymakers can respond to future demand in the labour market. [Online]. Available: https://www.weforum.org/agenda/2022/11/digital-skills-labour-market-future/

Walsh, J. A.,Cobb, P. J.,de Fremery, W.,Golub, K.,Keah, H.,Kim, J.,Kiplang'at, J.,Liu, Y.-H.,Mahony, S.,Oh, S. G.,Sula, C. A.,Underwood, T. and Wang, X.(2021). Digital humanities in the iSchool. *Journal of the Association for Information Science and Technology*, 73/2. Pp.188-203.

Ye, Junhan. (2022). The Application of Artificial Intelligence Technologies in Digital Humanities: Applying to Dunhuang Culture Inheritance, Development, and Innovation. *Journal of Computer Science and Technology Studies*. Volume 4. Pp. 31-38. DOI: 10.32996/jcsts.2022.4.2.5.

Zhang, J. F., Li, Y. J. and Yang, Z. H. (2021). Research on the dissemination of intangible cultural heritage based on information technology - Taking Cangzhou as an example. *Industrial Innovation Research.* Volume 19. Pp. 57-59.

Zhang, Y. and Wang, J. Q. (2021). The development and prospect of cultural industry in the era of artificial intelligence. *Yunnan Social Sciences*. Volume 5. Pp. 36-41.

Zhu, B. J. and Nie, H. (2016). Crossover and integration: Digital humanities from a global perspective - A summary of the first Peking University "digital humanities forum" conference. *Journal of University Libraries*. Volume 34 (5). Pp. 16-21. https://doi.org/10.16603/j.issn1002-1027.2016.05.003