Studying Emerging New Contexts for Museum Digitisations on Pinterest

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Abstract

In a SweClarin cooperation project we apply topic modelling to the texts found with pins in Pinterest boards. The data in focus are digitisations of Viking Age finds from the Swedish History Museum and the underlying research question is how they are given new contextual meanings in boards. We illustrate how topic modelling can support interpretation of polysemy and culturally situated meanings. It expands on the employment of topic modelling by accentuating the necessity of interpretation in every step of the process from capturing and cleaning the data, to modelling and visualisation. The paper concludes that the national context of digitisations of Viking Age jewellery in the Swedish History Museum's collection management system is replaced by several transnational contexts in which Viking Age jewellery is appreciated for its symbolical meanings and decorative functions in contemporary genres for re-imagining, reliving and performing European pasts and mythologies. The emerging contexts on Pinterest also highlight the business opportunities involved in genres such as reenactment, neo-paganism, lajv and fantasy. The boards are clues to how digitisations serve as prototypes for replicas.

1 Introduction

For more than one decade, the digitisation of collections and archives has been a major tool for heritage institutions to make their holdings widely accessible and fulfil cultural policy goals related to democracy. Open collection management systems, digital heritage portals such as Digitalt Museum and Europeana invite people outside institutions to share and interpret what they like. The advent of social media platforms has furthered this development and digital images of museum objects now extensively circulate online. Many museums now fully embrace the changes, encourage all kind of uses of their holdings and are curious about emerging interpretations outside the frame of museum knowledge.

In line with this development, digitisations, that is digital images of museum objects, from all kinds and sizes of museums now appear on the content sharing platform Pinterest. Major international museums link images to the platform, which promotes itself as a visual discovery engine. It invites users to create themed collections called boards, either by linking images from other websites or by selecting among the images circulating on the platform, for an example see Figure 1. The platform serves an increasing number of users with images out of a growing bank of pins (at the end of 2020, over 440 million of users and 200 billion of images). Once on Pinterest, images are set in motion by machine learning algorithms that present users with grids of images that change with each subsequent click.

The aim of this paper is to investigate new contextual meanings of digitisations of Viking Age Jewellery from the Swedish History Museum (SHM) on Pinterest. The museum does not post digitisations on the platform, still images of objects in its collection are numerous on the site. They are linked directly from the museum's open collection management system or from the museums Flickr account. But more often they have been linked to personal websites and blogs before inserted into Pinterest large bank of images (Wilson, 2016).

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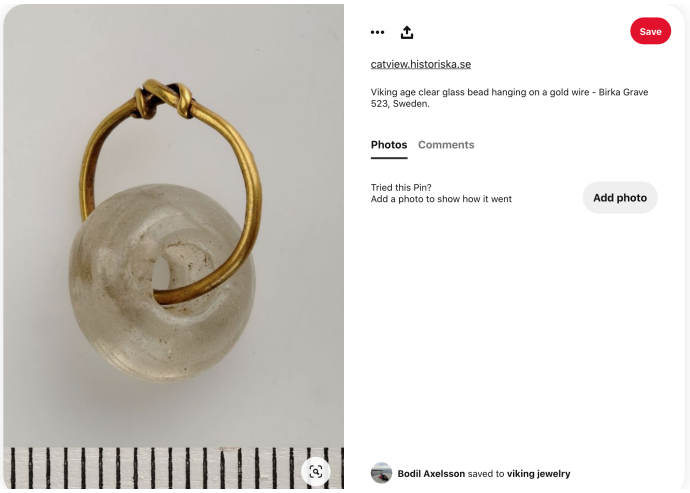

Figure 1: Typical pinterest entry used in this study.

Museum objects and their digital images are polysemic (Cameron and Robinson, 2007). Their meaning depends on available techniques and genres for interpretation, framing and contextualisation (Kirshenblatt-Gimblett, 1998). On Pinterest, they circulate as digital images in a space designed for consumption (Kidd, 2014). Here, their meaning depends both on how they are described in words and how they are displayed in boards. Digitisations from SHM that find their way to Pinterest are often recognisable as sourced from this museum. Moreover, they are depicted according to conventions for picturing the museum's objects, a view from above against a light greyish background, sometimes with a measure stick. In the museum's database, digitisations are embedded in knowledge developed for collection management and the discipline of archaeology such as inventory number, find location (place, parish, region and country), estimated dating, substance, category, keyword and type. When a user saves a digitisation on a board it is sourced with url and a brief text description of the user's choice. Consequently, only a selection of the museum's metadata is transferred to Pinterest. When on Pinterest, the platform identifies the digitisation with a signature that is common for all subsequent repinnings to additional boards and links are created between all the boards that contain the sourced digitisation (Liu et al., 2017). Each board to which the pin is subsequently saved provides a new context (Hall and Zarro, 2012).

2 Topic modelling and interpretation

The first author made contacts with the Swe-Clarin K-centre at Linköping University to discuss methods for analysing the text descriptions. We agreed that topic modelling would be a suitable technique for the purposes of the project, at the same time furthering the K-centre's skills and the CLARIN goals of supporting scholars "who want to engage in cutting edge data-driven research". Topic modelling is one of the language analysis tools provided by Clarin's Language Resource Switchboard and this paper expands on the employment of this tool by accentuating the necessity of acknowledging interpretation. We take from Drucker (2017) that data is always captured, counted, and represented by someone. Human decision making is involved in every step of topic modelling, from capturing and cleaning the data, to modelling and visualisation (Bechmann and Bowker, 2019). By reflecting on the role of human interpretation in the employment of topic modelling, we approach the "meaning problem" in digital humanities (Bode, 2019; Drucker, 2017; Liu, 2013).

At first, it seemed counter-intuitive to analyse digitisations on a site for visual discovery with a method for analysing texts. However, Pinterest API does not allow for downloading images and semantic information is vital for the platform's recommendation system. It is easily extracted and readable to both

humans and machines as clues to what image s represent (Zhang and Lapata, 2017). Thus, the users' brief text descriptions contextualise digitisations and other images on the platform and add to the polysemy of digitisations.

Opinions vary as to the extent to which topic modellings supports the analysis of polysemy. Proponents of the method argue that it takes a relational approach to meaning. Relying on specific probabilistic assumptions, the method groups co-occurring words and identify keywords for each topic. The different topics represent different contexts in which one and the same word can take on different meanings (Bode, 2019; DiMaggio et al., 2013). Jeffrey M. Binder instead argues that the method lures the analyst to assume that words have one single meaning because it dislocates words from their immediate linguistic contexts such as sentences and modality. Consequently, the analysis risks getting trapped in hegemonic word meanings and miss nuances. To counter methodological and linguistic naivety, interpretation emerges as a key issue in the application of the method (Binder, 2016). As concluded by Brett (2012), and Schmidt (2012) topic modelling indexes what the corpus is about, but a solid analysis builds on prior knowledge of the corpus and critical engagement with both the words that make up the topics and the presumable neutrality of probabilistic distribution.

In this study, the interpretation of words and topics are informed by an extensive engagement with the data. In fact, engaging with the data already in the phase of data capturing turned out to be a necessity. Pinterest's API did not provide any means to identify all boards that displayed SHM digitisations. An alternative sampling strategy had to be implemented. The strategy detailed below provides no way of estimating the representativeness, validity and reliability of the data in line with the parameters set up within quantitative social sciences, cf. Lomborg and Bechmann (2014). Instead, it secured that the interpretation of the topics was informed by a rich understanding of the data and its limitations.

The approach taken can be described as data-intensive heritage ethnography with a mix of human centred interpretation and automated data-capturing, cf. Bonacchi and Krzyzanska (2019). The starting point for the creation of data in this study, was a qualitative immersive experience with the aim of understanding how digitisations from the Swedish History Museum circulate on Pinterest. After entering the query "Swedish History Museum" in the platform's search bar, the recommendation service suggested the topic Viking Jewellery, a term that exists on Pinterest, but not in any museum database. The first author created the corpus by systematically scrutinising boards that included digitisations from SHM, suggested by the platform's recommendation system. She exclusively tapped on pins with brooches, pearls, rings, and necklaces from SHM that appeared in her home-feed, saved them on a board of her own and followed the boards where they were pinned. A second sampling strategy entailed selecting boards suggested by daily e-mail notifications with phrases such as "if you like Viking Jewellery [name of a board] you might also like" or "people like you were looking for Viking Women" [guided search category]. Simultaneously she took reflexive notes and screen shots. Thus, conditioned on the one hand by the researcher's ability to recognise objects from SHM and relevant boards, and, on the other hand, the platform's recommendation system, the collection of data took place between March 2018 and October 2018. It stopped when the platform's recommendation service started to suggest boards already collected.

Data from 480 boards created in interaction with the platform was fetched by using Pinterest's developer API. The dataset comprises a total of 329,999 entries. From this we filtered out both description and picture duplicates, and entries with empty description fields, giving us a dataset of 107,165 unique entries. Data was tokenized with the NLTK (Bird et al., 2009) tokenizer for English. The majority but not all descriptions are in English, we also identified Swedish, Russian, Norwegian, German and Dutch, but the English tokenizer was used for all languages. Thus, for dividing text into meaningful units we favoured English and did not treat all languages on equal terms and hence may have missed nuances in other languages cf. Bechmann and Bowker (2019). Furthermore, we filtered out words using the NLTK lists of stop words, with some domain specific additions such as image, search, and show, words that probably are auto generated by Pinterest or museums' websites. The texts were then lemmatized using the NLTK lemmatizer, and multi-word units such as Thor hammer were identified using bigrams and the *phrases* functionality in Gensim (Řehůřek and Sojka, 2010). With additional functionality in Gensim, we also filtered the dataset by pruning the words appearing in more than 90% of the boards. In most cases,

the threshold of the pruning of frequent words are set at higher levels (Maier et al., 2019), but due to some boards consisting entirely of languages other than English, the threshold had to be lowered for it to have any effect.

The human choices involved in our employment of topic modelling and visualisation of the topics are detailed below. As emphasised by Drucker (2017) and Drucker (2018), even though visualisations commonly are used for presenting data, they are not identical with the data but representations thereof. They are the outcome of curation and cleaning, parameterisation, the chosen model and the algorithms applied for its display. Therefore, Drucker (2018) proposes that visualisations should be environments for modelling. We instead draw the conclusion that the topics as displayed in the visualisation need to be carefully validated and interpreted. The first author made use of the ways in which topic modelling allows for identifying relevant documents for each topic. She returned to Pinterest to scrutinise signature boards, that is the boards with the highest probability for each topic (minimum 99 percent). She also returned to her field-notes to learn why and how these boards were chosen, inspected their grid of images and looked into descriptions and source links. Furthermore, she traced the possible meanings of the keywords generated for each topic in relation to how they were contextualised with pins, boards, the overall context of the platform, as well as in relation to how Vikings are conceived in archaeology and popular culture. The interpretation started from the proposition that meaning is dependent on shifting contexts, and that these contexts are reconstructed by the methods for detecting them cf. Seaver (2015). In this study then, contextualisation is on the one hand based in the processing of data in abstract mathematical space and then represented in the visualisation, and, on the other hand, something distinctly rooted in the situatedness and interpretive work of the first author, her knowledge about the boards and the role of Vikings Age jewellery in archaeology and various strands of popular culture.

3 Topic modelling

The purpose of topic modelling is to reveal thematic patterns in a collection of documents. The method enables extraction of knowledge from large collections of texts, that would otherwise be near impossible to analyse. In this study, the aim was to discover thematic patterns across a collection of boards all of which related to Viking jewellery one way or another. These thematic patterns are, after being extracted by a topic modelling method, represented as separate collections of keywords giving an overview of the most prevalent words in each topic.

We used Latent Dirichlet Allocation (Blei et al., 2003) to perform the topic modelling. Latent Dirichlet Allocation (LDA) is a generative probabilistic model where each document is represented as a mixture of latent topics, and each topic constitutes a multinomial distribution of words. The words with the highest probability in each topic are assumed to be the most probable representation of its content. To implement the LDA-model, Gensim was used. Gensim is a Python library that provides several tools for semantic modelling, one of which is a full implementation of the LDA-algorithm, namely the LdaModel class[1].

One of the main challenges when creating a good topic model is to determine the number of topics, which have to be specified in advance of its creation. To aid in this process, a coherence score shown to be largely correlated with human evaluations was used to assess the semantic quality of the topics (Newman et al., 2010). The assumption is that a model with a high overall topic coherence score produces topics that make more sense to a human, than a model with a low overall topic coherence score. Gensim implements the framework proposed in Röder et al. (2015) to calculate coherence scores, and this was also used in our study. The number of topics to use was decided after calculating the coherence score on a wide range of numbers of topics. In the end, 13 was found to give the highest overall score.

Other parameters used by the Gensim LdaModel were tuned according to the results of manual testing. The alpha value (α), that influences the prior distribution of topic weights in the documents, and the beta value (β), that influences the prior distribution of the word weights in the topics, are of great importance for the final results of the topic model. Earlier studies like Maier et al. (2018) suggest using the default β-value as implemented in Gensim, while altering the α-value. This approach was a starting point for

[1]For documentation, see: `https://radimrehurek.com/gensim/models/ldamodel.html`

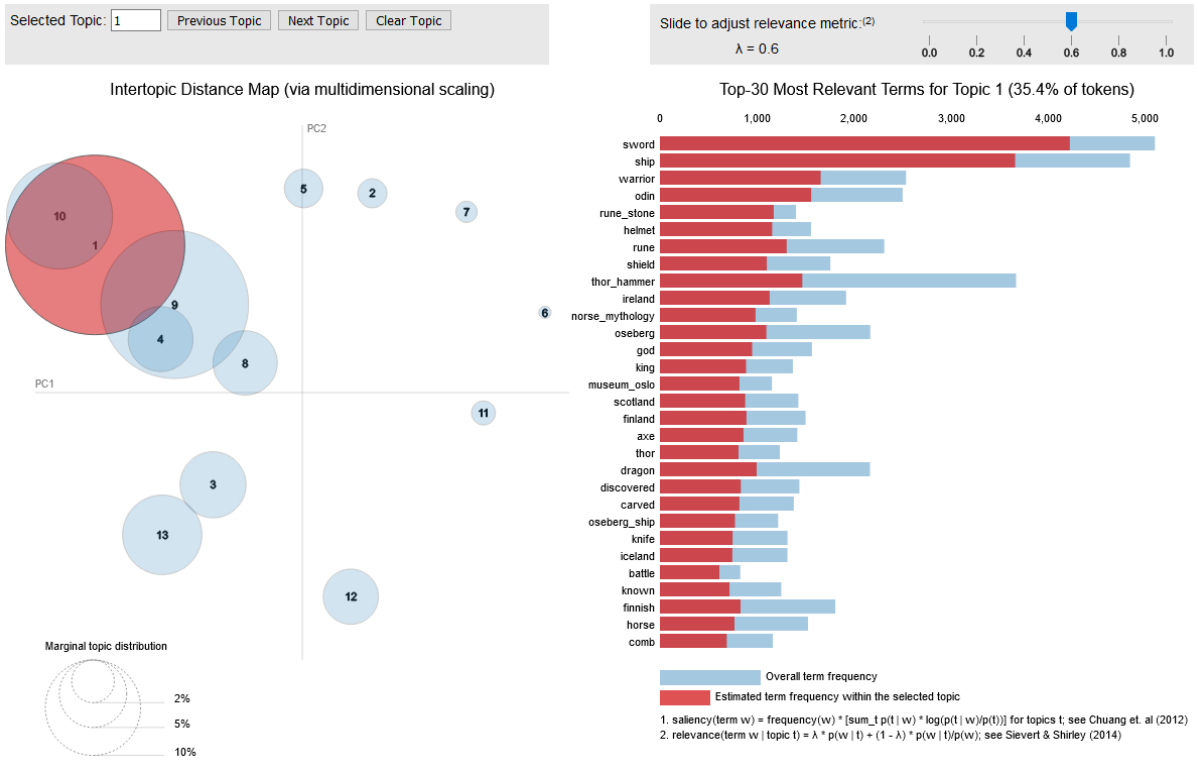

Figure 2: Visualisations of the topic models. Topic labels: 1. Norse Culture 2. Rings 3. Pearls 4. Pre-Christian Europe Cultures 5. Birka 6. Jewellery and trade 7. Brooches 8. Lajv and fantasy 9. Re-enactment 10. Viking Jewellery 11. Metal work 12. Shinies 13. Antique Jewellery.

our testing, and for the final topic model, the α-value was set to *symmetric* (which entails a value of $1/k$, where k is the number of topics).

The output of a LDA topic model using Gensim is a multinomial distribution over the topics and their most prevalent words. To aid the interpretation of the distributions we used a Python implementation of LDAvis (Sievert and Shirley, 2014), which through a web interface visualise how prevalent each topic is, as well as how the contents of different topics relate to each other, see Figure 2. The topic clusters are projected as circles in a two-dimensional plane, where the relative sizes and distances between the circles represent prevalence and similarity of the topics. This means that a topic with a large circle is seen more frequently in the entire collection of boards, and circles with a closer proximity share more features than circles that are projected further apart. In addition to the projection of the topics, there is also a bar chart of the most prevalent words in each topic. These are shown together with the frequency of the word in the entire corpus, allowing for a better understanding of the importance of the word in the current topic. LDAvis also introduces the term relevance, which is a way of ranking the words within the topics.

By adjusting the relevance metric closer to 0, it is possible to filter out words that are globally frequent, and assigning higher weights to words that are unique to the topic, while a relevance metric closer to 1 uses the standard ranks of the LDA model. The assumption is that globally frequent words might be too common and not accurately reflect what differs between the different topics. However, being too strict with the filtering comes with a drawback; the unique words are innately rare, which often makes the topics hard to interpret. That is, a word that is relevant to a topic will be undervalued and ignored, if it appears in another topic simultaneously. This is of particular importance for this study, where the descriptions all revolve around Vikings, and many relevant words are shared between topics. Sievert and Shirley (2014) therefore suggest a somewhat balanced relevance metric, about 0.6, which was also

the value we found produced the most meaningful topics[2]. Because the aim of the study is to explore polysemy and the contextualisations of digitisations, rather than to study hierarchies between words in each topic or between topics we did not consider an analysis of conceptual hierarchies. Instead, the fact that keywords appear across many topics is taken as the starting point for interpreting the many points of contacts between the topics.

4 Keywords, topics and cultural frameworks

The following analysis situates the keywords and topics in various strands of popular culture and fashion. The analysis evolves through each of the topics and considers how they are related in the visualisation. It starts from the visualisation's top right corner with broad topics relating to various appropriations of Viking Age Jewellery. It then proceeds to the top left corner of the visualisation in which the topics pertain to a specific archeological find location and particular types of objects. Finally, the analysis land in the lower part of the visualisation to discuss the ways in which jewellery associated to Vikings become part of jewellery collections with wider scopes.

The heart of the data is represented in the topic **Viking Jewellery**[3]. The topic's first keyword *thor_hammer*, is associated with an object with varying symbolic meanings, Figure 3. In Norse mythology, Thor's hammer or Mjölnir, is a magical weapon "that nor would fail or miss, nor would fly so far as not to return" (Skáldskaparmál I, 42, lines 20–34, cited in Knutson (2019, p. 39). Today replicas are worn by white supremacists and performers and fans of black metal. In the latter context, it associates to masculinity, strength and violence and sometimes implies a rejection of Christianity (Thompson, 2018, pp. 144-145).

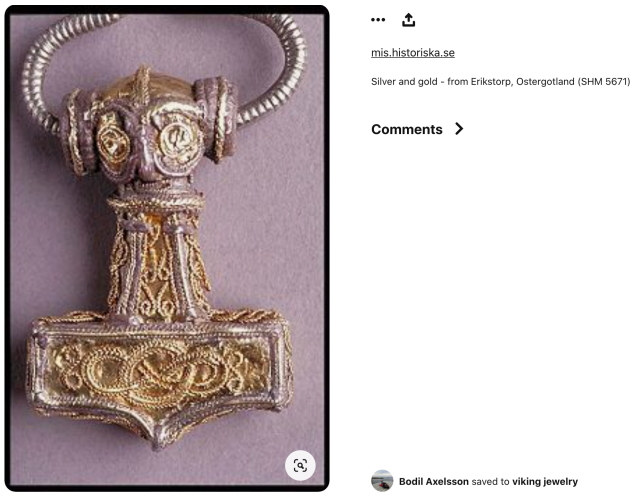

Figure 3: Thor hammer.

However, the topic Viking Jewellery presents a different context, more closely aligned with the ways in which Thor's hammer comes to matter as a playful prop or historising accessory for Viking enthusiasts and crafters at festivals and heritage sites, cf. Burlingame (2020), and Ashby and Schofield (2015). Among the other keywords are *finger_ring, fibula, arm_ring, oval_brooch, tortoise_brooch, disc_brooch, trefoil_brooch, penannular_brooch*. They are common grave finds and interpreted by archaeologists in terms of function or as representing regional styles, gender, social or cultural status of the carrier or different phases in the Viking era (Myrberg Bjurström, 2015). For female Viking enthusiasts and reenactors they are essential accessories (Kobialka, 2013; Price, 2019).

A row of keywords points to techniques for producing jewellery: *cast, mount, plate, gilded, twisted, filigree*. Others point to a measure for weighting objects (*gram*), a mineral for gemstones (*garner*): or

[2]The visualisation can be found at: `https://www.ida.liu.se/projects/sweclarin/Pinterest-topics/`

[3]In the following analysis, topics are bolded, keywords are in italics and the three most frequent keywords in each topic are underlined.

figurative motives such as *raven, dragon and animal-head*. One keyword points to a style (*Borre-style*), and three to cultural or geographical attribution: *anglo_saxon, saxon* and *finnish*. Finally, three keywords point to sources for the images (*fotoportalen-unimus, Sweden_shm*), and one to an e-commerce site where private persons and businesses exchange goods (*e-bay*).

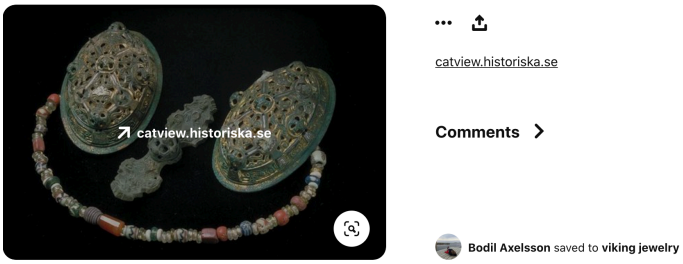

Figure 4: Brooches and pearls.

Imagewise, the topic is characterised by close-ups of pieces of jewellery, giving away ornamentations, shapes and details. Neither the range of different jewellery nor the width of the sources is reflected by the topic modelling method. In addition to the above mentioned types of jewellery the boards display pins, keys, amulets, religious objects, chains with household tools, and sets of Viking jewellery comprised of a pair of brooches and pearls, Figure 4. The artefacts range from simple round needle-pins to figurative objects. Digitisations from SHM are displayed side by side with digitisations from museums and heritage centres in the Nordic countries, Russia and the Baltics. Other sources are The British Museum and the Metropolitan Museum of Art, as well as a Tumblr account dedicated to Russian private collections. Furthermore, images are sourced from auction sites and web shops specialised in museum replicas or web pages that gather images and pieces of information about Vikings, jewellery or clothing.

In the visualisation, **Viking Jewellery** clusters with the topic that appears across the largest number of boards: **Norse Culture**. The keywords in this topic resonate with the masculine warrior cult associated with Vikings in popular culture (*sword, ship, warrior, odin, helmet, shield, thor_hammer, axe, thor, knife, battle*). Furthermore, the keywords rune_stone and rune point to memorials of travel, achievements or ownership (Källström, 2016) or magic (Bäckvall, 2019). Some keywords point to the grounds for knowledge production (*discovered, known*), to a Norwegian find location where the remains of two women were found in a ship decorated with wood carvings and several *horses* (*oseberg_ship and Oseberg*) and the museum that displays the ship (*museum-oslo*). Others point to locations (*ireland, scotland, finland, finnish, iceland*). Finally, the keywords *norse mythology, god* and *dragon* add a mythological context.

The images of the signature boards for this topic nuance a strong emphasis of masculine warrior cult that comes forth in the keywords. In the signature boards for this topic, images of artefacts from a range of museums in Scandinavia and the UK mix with images of open graves from archaeological digs, lush green landscapes, national or regional monuments, household utensils as well as interiors and exteriors of recreated buildings such as festive halls. One signature board displays memes comprised of aphorisms or brief facts from Norse Mythology illustrated by present day imagery in the style of the fantasy genre: giants, Valkyrias and warriors as well as mythical creatures such as snakes and dragons. Another signature board instead displays memes created by an American jewellery designer with brief historical "facts". Because these memes turn text into stylised graphical images, the entirety of their content was not picked up by topic modelling. Consequently, the memes contribute to a wider contextualisation of museum digitisations in the intersection of historical knowledge, mythology and popular culture. All in all, the images suggest that authentic archaeological objects mix and mingle with conceptions of Vikings in romantic fiction, studies of runes and Icelandic sagas (Ward, 2000), and not the least how historical Scandinavians are portrayed as Vikings in heritage tourism, fantasy inspired video games or series and popular history shows on pay television networks (Birkett and Dale, 2019). Importantly, the ways in which the musealisation of archaeological objects, the creation of monuments and heritage sites have been influenced by national sentiments are downplayed in favour of a transnational mix of motives.

The second most prevalent topic is labelled **Re-enactment** to reflect the way words and images here place Viking jewellery in the practice of recreating everyday life of the Viking Era. The most frequent words allude to female coded garments such as *dress* and *apron-dress*, but other keywords point to gender neutral clothing (*tunic* and *coat*) or accessories (*shoes, belt*), materials for garments (*wool, linen, silk, textile*), techniques for dress-making (*embroidery, trim, stich*). Some tokens refer to find locations (*oseberg, hedeby*) whereas *ru* refers to Russia where there are active reenactors and Viking finds are prevalent in certain areas. Keywords such as *ship, helmet* and *rune* testify to overlaps with the topic **Norse Culture**.

Taken together keywords such as *costume, outfit, garb, replica, reconstruction* and *tutorial* allude to the practice of re-enactment. Re-enactors meet at festivals and heritage sites to display and relive the past by immersion in dynamic webs of sensuous experiences (Axelsson, 2010). Material culture such as costumes, jewellery and props is conjured up from historical sources such as archeological finds and it is key to how re-enactors produce a sense of authenticity and immersion into an imagined historical past (Daugbjerg, 2013; Holtorf, 2013; Kobialka, 2013). In this context, the keyword love may be interpreted as an expression for admiration of the Viking Age, the care for crafting or the care-taking of men (Karpinska, 2019).

Imagewise this topic is characterised by a blend of digitisations of all sorts of Viking jewellery, images of predominantly young women dressed in long dresses with aprons decorated with brooches and necklaces, men dressed in Viking garb, household utensils, patterns or sketches, closeups of details in the outfits or hairstyles, and not the least scenes from reenactment festivals with women and men cooking, crafting, playing or just posing for the camera in their outfits. The scenes are sourced from both personal blogs and websites for crafters manufacturing and selling reproductions of reenactment gear.

In the visualisation, the topic **Re-enactment** encloses and overlaps the topic **Pre-Christian Europe**. Many keywords in the latter topic point to people, tribes, kingdoms or more broadly speaking cultures that populated, migrated and at times ruled across Europe from the late iron ages to the early middle ages (*celtic, saxon, celt, merovingian, téne, tene, ostrogothic, gaul, visigothic, slavic-kijevian, frankish, irish, ireland, culture_frankish*). Similar to Vikings and the Viking Era, contemporary knowledge of these cultures is elusive and rests on archaeological finds, medieval texts and folkloric documents. Taken together the keywords *celtic, celts, torque* and *celtic_knot* point to the centrality of this culture for the topic. Again, some keywords refer to types of metal artefacts (*fibula, torque, belt-buckle, buckle*), jewellery production (*plate*), or material (*garnet*), including also a Russian term for antique metal collectables виолити антиквариат. There are also keywords that refer to sources such as a Norwegian collection database (*fotoportalen-unimus*), a UK-based database for archaeological objects found by members of the public in England and Wales (*antiquity_scheme, recorded_portable*), and a St Petersburg-based workshop specialised in replicas of Scandinavian, Celtic and Slavik ancient jewellery (*ruyan_ruyanworkshop*).

Two text tokens – *pagan* and *mjolnir* – point to how Vikings and Celts today nourish contemporary paganism or heathenry, religious beliefs practiced mainly in the US and Europe that take inspiration from Germanic Pre-Christian European religions and adopt them to the present (Strmiska, 2017). In this context, Mjolnir, or Thor's Hammer, often is a symbol for expressing religious identity or faith (Cragle, 2017).

The imagery of the signature boards for this topic displays closeups of artefacts from Viking grave finds with pictures of predominantly Celtic material remains. They display a variety of metal artefacts such as pendants, brooches, and figurines. This means that the ornamental styles associated with Vikings are set side by side with the decorative style connected to the Celtic cultural sphere, for example the torques, a stiff twisted or decorated neck ring. In addition to content highlighted by topic modelling, images display figurative heads and bodies made in sandstone or metal artefacts in the shapes of animals and deities associated with Norse and Celtic mythologies. The context of paganism or heathenry hence comes forth in the motives of some of the displayed artefacts.

In the topic **Lajv and fantasy** keywords like *make*, *deviant_art*, *larp, cosplay, fantasy* point to several genres for imagining the Viking Age that differs from the search for historicity and authenticity in re-enactment. For example, lajv encompasses sewing costumes, arranging props and creating char-

acters for the improvising of a role play set out in a fantasy world (Lundell, 2014, pp 14-15). Similar to cosplay and larp, the genre is indifferent to principles of reality to instead rely its own set of rules often inspired by transmedial storyworlds from video-games and television series (Vu, 2017). In the topic **Lajv and Fantasy**, keywords referring to sources (*thecasperart_deviantart* and *ArtStation*) further points to these contexts, and so do keywords like *diy, inspiration, recipe, armor, leather_armor, skirt*. Nevertheless, this topic shares many keywords with the four previous topics. The keywords *odin, rune, helmet, warrior, dragon* are shared with **Norse Culture**. *Celtic* is shared with **Pre-Christian Europe** and *make, deviantart, costume, dress, embroidery, leather, tutorial, tunic* and *love* with **Reenactment**. However, the ranking of the keywords differs.

Imagewise, this topic displays similarities with the topic **Re-enactment** with numerous images of young women dressed in long dresses, aprons and jewellery sets, sourced from personal blogs, Tumblr and Flickr accounts as well as from webpages for roleplay societies or craft entrepreneurs. However, digitisations of viking jewellery or present-day replicas are scarce. This topic instead displays a greater variety of styles, including men in armoury, women in medieval dresses, figures in post-apocalyptic style as well as female shamans and fantasy style drawings of women in warrior outfits.

In addition to these broader topics, the method singled out rings, brooches, pearls, and the Swedish archaeological site Birka by the specificity of their aboutness. The topic **Brooches** mainly displays digitisations of various types of oval brooches from museums in Scandinavia. The topic **Rings** displays neckrings, armrings as well as fingerrings pictured by museums and auction houses together with replicas for sale on etsy. **Birka** is one of many archeological find locations represented in the data from which textiles and jewellery finds have become the basis for reenactors' outfits, cf. Karpinska (2019). Birka, on the island of *Björkö* in the parish of *Adelsö*, has long been of interest to Swedish archeologists (*holger_arbman*; *greta_arwidsson* and *agnes_geijer*). Recent digs have been documented on a webportal run by SHM, thus given the site and re-interpretations of graves and finds increased Internet presence[4].

The method also singled out a topic that focused the craft of making jewellery. The topic **Metal work** is represented by keywords such as *tutorial, knit, wire_wrapped, diy, make, scroll_saw,* рукодел (needleworker), *making_daily, chasing_tool, wire_wrapping,* проволоки (wire), *fretwork_pattern, making,* технике*_wire* (teqnique_wire), *fireplace_screen; materials aluminium, metal, stained_glass, beading_gem, copper* as well as products *ear_cuff, tiara, knit_bracelet, crown,* and motives *elf_ear, elvenear, seahorse, dragon.* One keyword points to a source (*Youtube*). The signature board testify to that this topic stretches beyond Vikings. It displays a variety of jewellery side by side with tools and procedures for making them.

The topic **Pearls** comes out as more varied than **Brooches** and **Rings**. A row of keywords refers to specific gemstones, materials or techniques for manufacturing pearls (*carnelian, mosaic_glass, agate, blue_glass, eye, bead_motive, melon_bead, blue-white phoenecian_glass*). Other keywords attribute pearls to archeological find locations (*Ribe* and *Kaupang*) or styles and cultures (*vikingtid_sted, roman, phoenecian, phoenecian_carthagian, islamic*). A second cluster of keywords points to Norwegian museum data bases (*kari_bestillingsnr lisens, fotoportalen_unimus, nedre_fotograf, gjenstand_perler, hammer_åse*), a private not-for-profit museum dedicated to glass and glass making in New York (*corning_museum*), and Hunterian, University Museum Glasgow (*glahm_bead*). The keywords *string* and *stk-halskjedje* refer to how pearls are mounted and *hon_skatten* refers to a large hoard of pearls and gold artefacts held by Oslo Museum of Cultural History. Finally, *roman_mosaics* have been used as a source to how pearls have been worn and the keyword *trade* refers to the economical role of pearls.

In terms of images, the topic mixes digitisations of single monochrome or poly-chrome beads with displays of groups of pearls, pearls on strings to form necklaces or bracelets or pearls in jewellery sets. Many are sourced from museum data bases, but there are also links back to blogs conveying historical knowledge, news-sites and retail websites. The presence of catalogue sheets or sample cards make this topic stand out from all other topics. These cards give an overview of pearls in different shapes and they are sourced from museum data bases as well as from retailers selling replicas of pearls from archaeological digs.

[4] https://historiska.se/birka/

Finally, there are three topics that include occasional digitisations of Viking jewellery from SHM in boards that have different geographical and periodical scopes than the European Middle Ages. The topic **Ancient Jewellery** borders the **Pearl** topic and share the tokens *roman* and *pearls*. However, the topics are clearly differentiated in terms of the range of jewellery types, for **Ancient Jewellery** (*earring, cameo, finger_ring, hoop, signet_ring, fibula, badge*), materials (*garnet, pearl, emerald, amethyst, bezel*), and associated techniques (*engraved, enamel, enamelled and cabochon*). Two keywords refer to dating (*circa_century, bce*) and a cluster of keywords attribute the jewellery pieces to what is commonly referred to as the classical Antiquity or Mediterranean empires (*roman, byzantin, hellinistic, etruscan*) and related contemporary nation states (*italy, france, french, greece, greek*). In addition, some pieces of jewellery are attributed to the *scythians*, a nomadic people involved in trade networks connecting Greece, Persia, India and China. The images in the board that best represent this topic display exquisite golden artefacts from museums, auction houses and new sites. The dominance of gold gives away the impression of wealth and exclusivity.

The topic **Shines** instead places occasional SHM digitisations in the context of contemporary jewellery design. Materials and techniques refer to jewellery pieces that are accessible for a broader public (*sterling_silver, copper, sterling, oxidised*). With the exception of diamond, the keywords that refer to gemstones point to cheaper materials (*turquoise, aquamarine, pearl, labradorite, opal, quartz, rose, moonstone*). The focus is on what one can order (*etsy, via_etsy*). But importantly, keywords such as *handmade, handcrafted, artizan_jewellery, wire_rapped* and *hammered* refer to crafted rather than mass-produced goods. In this topic, jewellery is contextualised by keywords associating to fashion styles such as *boho, artisan* and *vintage* and described in contemporary vocabulary such as *ear_ring, dangle_earring* and *bangle*.

The final, and smallest, topic **Jewellery and trade** is placed in the periphery of the top left corner in the visualisation. Drawing together keywords for attribution such as *yemen, tibetan, hilltribe, tibet, antique_african, indian, african* and *morocco* it points to places outside outside Europe and North America. Furthermore, keywords point to materials in brown, yellow or variety of nuances of red (*dzi_bead, pema_raka, cinnabar, coral*) and other materials such as *marble* and *celloluid*, and a Japanese bead for fastening cords often produced of ivory (*asian_ojime*). Some of the keywords point to contemporary jewellery stores and workshops that specialise in antique jewellery and gemstones (*lewis_clark, columbia_river, mitchell, dorje_design*), a Canadian retail business group (*hudson_bay*), as well as to how antique beads today are for sale (*sample_card*) and are ideal gifts (*card, blank_card*). Finally, the topic includes keywords that places beads and pearls in the context of colonialism and the exploitation of African resources (*antique_venetian, african_trade, venitian_trade, trade, venitain_sample*). Glass beads produced in Venice, an early center for Asian-European trade, were used as a cheap and easily produced currency in the exchange for African raw materials and slaves[5]. Thus the topic associates to historical transactions between Europe, Asia and Africa at the same time as it testify to contemporary aesthetisation and commodification of heritage pieces and replicas thereof.

5 Conclusion

The interpretation of new contexts for Viking Age Jewellery sourced from SHM presented in this paper relies not only on how meaning emerge as relations between each topic's keywords, but also on the ways in which images are collected in boards and how keywords and images can be situated culturally. It turned out that the topics and the keywords provided a valid tool for exploration and further interpretations of new contexts for SHM digitisations. In fact, the way in which topic modelling enabled a reduction and mapping of only a share of an abundantly rich empirical material – the users' descriptions – provided a necessary first step for further interpretative work. Topic modelling was especially valuable for investigating polysemy as many topics shared some keywords. It should also be noted, and in line with the method (DiMaggio et al., 2013), many boards mix topics. This could be taken as an evidence of unexplored additional polysemy. It should also be noted that the interpretation of keywords required clustering them thematically, rather than relying on their probabilistic distribution within the topic. Be-

[5] `http://www.vam.ac.uk/content/articles/t/trade-bead`

cause pinners only to a less extent acknowledge sources in their descriptions, the method did not fully account for the variety of sources within each topic. This may be further investigated by analysing the images' url:s more systematically. Nevertheless, the highlighted sources direct the attention to the fact that the contexts for SMHs digitisations include various museum databases, re-enactors' blogs and websites, news sites, and not the least websites of a variety of businesses selling both replicas and original jewellery.

The inspection of the signature boards reveals that there are some discrepancies in the relations of the topics in the visualisation and how relations between topics come forth in the cultural analysis. Taken together the cluster of large topics displayed at the top left corner of the visualisation singles out **Viking Jewellery** as a consistent topic first and foremost overlapping with the topic Norse Culture. But this does not do justice to the centrality of Viking jewellery for the topic of **Re-enactment**; the many depictions of **Viking jewellery** in the signature boards and the ways in which digitisations of grave finds serve as models for replicas in this genre for performing past times. Furthermore, culturally, there are more overlaps between the topics **Norse Culture, Pre-Christian Europe and Lajv and Fantasy** than the visualisation reveals. They are connected by influences of early Germanic mythologies, in particular the various symbolical values attached to Thor's hammer and mythological creatures. Thus, genres for imagining the past as well as contemporary conceptions of historical cultures and mythologies leak. It may also be more relevant to discuss **Rings, Brooches, Pearls** and **Birka**, all very specific topics singled out by the method and projected as separate in the visualisation, as subtopics, also present in the larger topics as these also display these types of objects. The visualisation of **Ancient Jewellery, Shinies** and **Jewellery and trade** as detached from the topics in the visualisation's left right corner is consistent with the cultural analysis. However, the political and economical perspectives that come forth in the analysis of **Jewellery and trade** may also be relevant to apply to all the other topics. This very small topic, which at first, may seem an odd context for Viking jewellery, serves as a reminder of the fact that the materials for Viking jewellery historically were part of Early-Medieval relations involving trade and conquest.

To sum up, on Pinterest, the national context of digitisations of Viking Age jewellery in SHM:s collection management system is replaced by several transnational contexts. Archaeological frameworks give way for contexts in which Viking Age jewellery is appreciated for its symbolical meanings and decorative functions in contemporary genres for reimagining, reliving and performing European pasts and mythologies. The emerging contexts on Pinterest also highlight the business opportunities involved in genres such as re-enactment, neo-paganism, lajv and fantasy. The boards are clues to how digitisations serve as prototypes for replicas.

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