

👤: Emoji and Religion in the Twitter Discourses on the Notre Dame Cathedral Fire

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Abstract

The fire that destroyed a large part of the world-famous Notre Dame Cathedral in France in April 2019 shocked the world. A lively expression of thoughts and feelings during and after the fire arose on Twitter. In this article, we will analyze the discourses about the Notre Dame fire on Twitter, with a specific focus on emoji, focusing on the thoughts and feelings emoji express and how they convey the meanings religious buildings have for people. Based on a dataset of almost 2 million tweets collected in the week following the incident, this paper leverages a variety of computational and qualitative methods to explore the topic from different angles. Temporal analysis and topic modelling show the dynamics of emoji usage, which drastically changes after a few days from expressing sorrow to expressing skepticism. Semantic analysis using

the word2vec model reveals the implicit meaning of potentially ambiguous emoji characters.

Keywords

Twitter – cathedral – emoji – church – social media – sacred space – Notre Dame – religious architecture – internet

Introduction

On April 15, 2019, the world-renowned Notre Dame Cathedral in Paris caught fire. The global media attention to the partial destruction of the Cathedral shows that religious heritage transcends its meaning as a place of worship for believers, since it was a global matter of interest for people from different religious and non-religious backgrounds. This makes an interesting case for religious studies, since it raises questions about the significance of religious buildings in public discourses: which connotations and meanings are ascribed to a cathedral? Is it a signifier for religion and faith, or rather for a national identity, or does it perhaps resonate most with individual memories of international tourists visiting Paris? To a certain degree, finding whether or not a cathedral can be primarily considered a religious building might also be interpreted as an indicator for the contemporary significance of religion in western European public awareness.

Studies show that religious buildings are appreciated for a multitude of reasons besides their religious functions, such as their architectural, art historical, and cultural values. This is especially true for famous landmarks like Notre Dame Cathedral, which attracts roughly 14 million visitors a year and counts as one of the most visited sites in Paris (Gravari-Barbas & Guinand, 2017, p. 317). In the following sections, we will seek to deepen those findings on a specific data basis, i.e., communication on Twitter during and in the aftermath of the Notre Dame fire. Twitter is a contemporary medium for microblogging and storytelling where people, employing up to 280 characters, can create their own narratives, share and comment on other people's opinions, and connect with like-minded users (Papacharissi & de Fatima Oliveira, 2012). In addition, users can employ hashtags, which are marked by the symbol "#", and thus emphasize keywords and create connections with people that use the same terms. In this article, we will present a quantitative and qualitative analysis of reactions to

the Notre Dame fire, which were communicated via Twitter in the first week after the incident, asking primarily for topics and their dynamics in general. Second, we are specifically interested in the meaning that is ascribed to the Cathedral by the individual users. We will therefore also focus in particular on the affective dimension of reactions and integrate analysis of the use of emoji. The word emoji stems from Japanese 絵文字 “pictograph”, but more specifically describes pictorial symbols that indicate, e.g., facial expressions, objects, animals, or abstract signs and are now frequently used in electronic communication media (“Emoji”, 2021). Emoji are a universal visual language that often condenses emotions in internet exchanges (Ge & Gretzel, 2018). Reviewing the recent literature on emoji it seems plausible that they can offer insights into an additional level of affective expressions (Troiano & Nante, 2018). Therefore, we will explore (1) the meaning and appreciation of historical religious architecture, (2) the role social media plays with regard to religion and emotion, in this case using Twitter as a means of expressing emotions, and (3) the way in which people responded on Twitter with a specific focus on emoji usage following the destructive fire on April 15, 2019.

Public Sentiments towards Historical Religious Architecture

The partial destruction of Notre Dame Cathedral evoked strong reactions and a vivid display of emotion on social media. The burning cathedral triggered emotional responses in many people worldwide. Therefore, we will address here some existing studies that deal with sentiments people have towards religious buildings. These studies took place in national contexts in Germany and Britain.

A study concerning societal responses to church reuse in Germany addressed the broader topic of appreciation and significance of church buildings by the German population (Allensbach, 2009). This study shows that these buildings are appreciated for various reasons by the general public and not just by churchgoers. A mere 15% of the population does not like to visit church buildings. The majority of the German population appreciates church buildings. This appreciation is connected to a transformation of feelings that church visitors experience upon entering a church building, as well as an appreciation of the atmosphere of tranquility therein. The reasons for these transformed feelings are only partially religiously motivated; in difficult life situations, people feel consoled when they enter a church building, regardless of whether they identify as a person of faith or not. Church buildings are also appreciated as places of historical interest. Forty-three percent of the respondents claimed to

have a favorite church building. Every second person favored a church that was situated farther away from their local proximity: famous churches such as the Cologne Cathedral, Notre Dame Cathedral, or another church visited whilst on vacation. These churches are predominantly enormous structures, described by the respondents as impressive and monumental, and they are appreciated for their atmosphere and tranquility, decorations, paintings, stained-glass windows, and interior (Allensbach, 2009, pp. 15–18, 39–41).

A study on religious tourism partly focused on cathedral tourism in Britain. Motivations for visiting cathedrals are historic and architectural interests or recreational or educational reasons, and these prevail over spiritual reasons (Olsen, 2013, pp. 46–47; see also Freyer & Behrens, 2013, 200, who argue that cultural reasons dominate over religious-spiritual reasons when people visit a church). Experiences during a cathedral visit are often of an emotional nature because of the “perception of sanctity”, of being in awe of the architecture, or of having “what they considered to be an authentic spiritual or religious experience” (Olsen, 2013, pp. 46–47).

This emotional nature is also underscored by a study (Voase, 2007) on consumer experience during a cathedral visit:

the experiential nature of the visit to a cathedral is of the romantic kind. It is primarily emotional, a product of affective and reflective processes. Colloquially speaking, it is an experience of the heart rather than the head. (...) visitors regard cathedrals, both their ‘own’ and those in other localities, as quasi-public territory. (Voase, 2007, pp. 51–52)

A ground for the global emotional outburst in response to the Notre Dame fire may well lie in the appreciation people have of historical architecture because these sites create place attachment as a result of continuity with the past (Lewicka, 2008, p. 211). Another study on place attachment asserts that “Places come to be invested with deep emotional meaning so much so that collective sentiments strongly resist attempts to change or alter the setting” (Mazumdar & Mazumdar, 2009, p. 310). This emotional meaning comes to the fore if a religious building is under threat of being reused, demolished, or destroyed (De Wildt & Plum, 2019). In the case of a world-renowned monument such as Notre Dame Cathedral, elements of collective memory and intensity of loss come into play (Moon, 2019). This can be ascribed to larger sociological discourses on people’s attachments to religious identities, bringing concepts like “vicarious religion” to mind. This concept sheds light on the ascribed value of the presence of people and buildings, which maintains a degree of public religiosity

also on behalf of those who no longer attend religious services (Davie, 2002). In the case of Notre Dame, diverse aspects as well as closely intertwined bundles may be at the root of these emotional reactions to the involuntary partial destruction of the cathedral.

Social Media, Religion, Mourning, and Emotions

In addition to its broad secular use, Twitter is also used as a channel for religious communication. Since it was established in 2006, Twitter has hosted several religious voices. For instance, the Vatican created a Pope Twitter account in 2013, thus creating a new type of “digital leadership” for Roman Catholics (Guzek, 2015; Narbona, 2016). Twitter and social media in general can offer venues for people to articulate religious identities (Wills & Fecteau, 2016; Pennington, 2018) or for different religious groups to establish interfaith dialogue (Illman & Sjö, 2015). The platform is thus a rich source for research into contemporary religion.

Not only religious communication in a strict sense, but also more loosely religion-related discourses can be studied on the platform. Users negotiate various aspects of faith, religion, religious institutions, or worldviews, often without revealing the religious or non-religious background or motivation behind their tweets. The discourse on the destruction of a religious building thus blends a variety of reactions that can but do not need to refer to religion. They often contain emotional reactions to the Notre Dame fire, religious and/or otherwise, which have been amplified by circulation on social media. In the aftermath of the event, people expressed sorrow, solidarity, anger, and even criticism through textual and visual Twitter narratives. These types of reactions characterize the use of contemporary communication networks. As Jodi Dean (2010) asserts, users produce and inhabit “affective networks” by creating connections on the internet. In this regard, Zizi Papacharissi (2014) also uses the term “affective publics” to describe the formation of groups on Twitter as a way of organizing social actions around shared emotions. Emotional exchanges on Twitter are enhanced by the use of images, which might trigger powerful emotional reactions through holding a deep symbolic power over consumers. Iconic images, such as the picture of a drowned 3-year-old Syrian boy taken in 2015, give relevance to a specific story and emotionally impact internet users through their circulation on social media (Dahmen et al., 2018).

As is the case with the burning of Notre-Dame, affective reactions on the internet are often connected to images of destruction and violence that circulate globally (Kraidy, 2017). Several examples can be found in response to terrorist attacks as a way of mourning and expressing solidarity and fear (see the example of the 2005 London bombing; Mitchell, 2006). The exchange can be a part of a hybrid media event (Huhtamäki et al., 2018, on the Charlie Hebdo attack) being broadcast and described on a variety of different platforms, including Twitter. A characteristic of hybrid media events is the sharing of affect, often addressed on Twitter as a ritualist way to manage emotions by bringing together a multitude of individual voices. Twitter users also address the question of religion by reflecting on the place of Islam in Europe. Other examples show how hashtags can express solidarity with the victims or help to articulate complex social and religious identities (e.g., #JeSuisCharlie and #JeNeSuisPasCharlie; Giglietto & Lee, 2017).

Similarly, the terrorist attacks in Paris in November 2015, which killed more than a hundred people, triggered a high number of Twitter reactions also connected to religion and religious identities. The hashtag #PrayforParis – which explicitly references the religious act of “praying” – was used as an “established solidarity symbol” and triggered the sharing of emotions as a cultural practice to express grief (Döveling et al., 2018). #PrayforParis has also been used to comment on the Notre Dame fire. Twitter reactions to the Paris terrorist attacks of 2015 involved both Islamophobic responses, blaming Islam for being a supposedly violent religion that is incompatible with European values, and tweets in support of Muslims, which advocated social cohesion (Magdy et al., 2015). Within the category of Islamophobic discourses, hashtags such as #Islamexit (circulated in the aftermath of the Brexit referendum) and #StopIslam (created in the aftermath of the 2016 terrorist attacks in Brussels) show how the internet can enhance Islamophobic discourses (Evolvi, 2017; Poole et al., 2019). Differently, the hashtag #NousSommesUnis (“We Are United”) was created to promote social cohesion and interfaith dialogue and to help Muslims mourn the victims and condemn Islam-inspired violence (Evolvi, 2019).

Twitter reactions to the Notre Dame fire, although resembling these examples in expressing solidarity on a global scale, were not connected to violence perpetuated by a specific group. Rather, Twitter users discussed the significance of Notre Dame as a religious, cultural, and historical building. The description of emotions is captured not only through textual analysis but also with attention to the use of emoji. While their use and design have limitations, emoji are polysemic and can assume various meanings (Highfield, 2018). According to Luke Stark and Kate Crawford (2015), emoji can function as “emotional coping strategies” and “a novel form of creative expression” (p. 1). This

means that emoji can sustain some emotional labor practices such as helping people express their joy, sorrow, or anger online. However, it leaves a leeway for interpretation. For instance, a smiley face is a powerful symbol of social bonds and relations, but it can also be employed in marketing to promote positive feelings. Therefore, emoji can be employed in affective exchanges and visually represent people's feelings in certain situations, such as the Notre Dame fire. Through the analysis of tweets that contain emoji, we explore the following research questions: what are the predominant topics discussed on Twitter in relation to the Notre Dame fire, and how do they evolve in time? What are frequently used emoji, and which emotions do they convey in relation to people's feelings in relation to religious buildings?

Data and Methods

This study is based on a collection of tweets obtained through Twitter's Standard Search API.¹ Two subsequent search runs were made using the tool twarc² on April 18 and 25, 2019, using the query "Notre Dame" OR #NotreDameCathedralFire OR #NotreDame OR #NotreDameFire OR #NotreDameenfeu. The query included hashtags that appeared frequently in the Twitter discourse after the fire. In order to also capture tweets that do not explicitly use any of the hashtags, the verbatim phrase "Notre Dame" was added to the query. The aim was to capture as much related discourse as possible. Since the term "Notre Dame" is ambiguous, the corpus also contains a small number of tweets relating to, e.g., the university and sports team of the same name. However, as the analyses show, these make up only a fraction of the corpus. After collecting the tweets, they were filtered in order to include only those tweets sent between the start of the fire at 16:20 UTC on April 15, 2019, and exactly one week later, April 22. Retweets were excluded.³

The resulting dataset contains 1,910,755 tweets by 1,073,414 distinct users. It contains only the text of the tweets, including the emoji, but not any embedded media. Thus, the analysis is limited to the linguistic aspect of Twitter discourse. According to Twitter's language information, the collection contains

1 <https://developer.twitter.com/en/docs/tweets/search/overview>.

2 <https://github.com/DocNow/twarc>.

3 Due to the number of tweets, the query rate limit, and the limited time window for searches of 6–9 days, it is not certain that all tweets were collected, since the crawls took several days to complete and some tweets might have been out of the time window by the time the crawls were finished.

tweets in 63 languages, the majority of them in English (793,848) and French (375,157).⁴ Unless stated otherwise, tweets in all languages have been included in the analysis. As Figure 1 shows, the most intense reactions to the event were on Monday evening in the hours after the fire started. The number of tweets then significantly dropped in the following days.

In order to analyze emoji usage, a subset of tweets has been created that contains only those embedding emoji. This subset contains 267,545 tweets with 374,716 unique emoji.⁵

In order to analyze the Twitter discourse and especially the contexts in which the emoji have been used, two complementary approaches have been chosen:

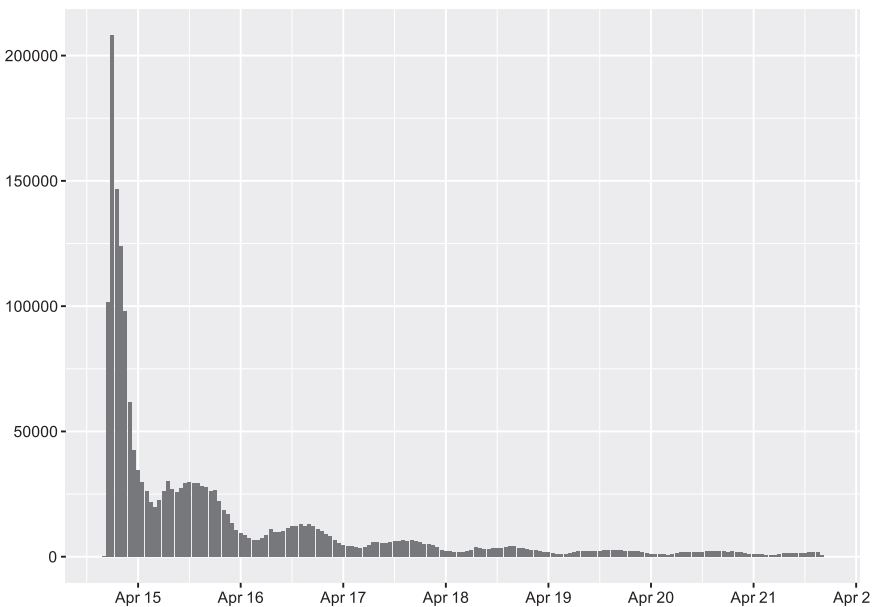


FIGURE 1 Tweets (w/o retweets) per hour

4 Since Twitter does not ask users to explicitly state the language of their tweets, it uses internal algorithms to detect the language of a tweet automatically. It currently cannot assign more than one language to a tweet, and it flags tweets as “undefined” when it cannot detect the language. See <https://developer.twitter.com/en/docs/tweets/data-dictionary/overview/tweet-object>.

5 In this context, multiple occurrences of the same emoji in one tweet have been counted as one.

- (1) The first approach employed in this research focuses on the content of the tweets. Instead of exclusively looking at how individual emoji are used, we tried to identify recurring topics or discourses that are discussed in the tweets. For this purpose, we used a technique called topic modeling (Blei, 2012). Topic models are a family of algorithms from machine learning that can be used to reconstruct dominant topics based on co-occurrence patterns in texts. We used the Latent Dirichlet Allocation algorithm (LDA; Blei et al., 2003) as implemented in MALLET (McCallum, 2002). LDA assumes that texts cover distinct topics, and that topics can be identified by typical words. Given a number of topics, it tries to reconstruct the latent topics and yields thematic word lists and distribution patterns as a result.

For this analysis, we concentrated on English language tweets, as they represent the largest linguistic group in the data. Tweets are notoriously difficult to analyze by topic models because of their limited length. Topic models need individual texts of a certain length in order to identify meaningful recurrent patterns (Hong & Davison, 2010). Therefore, we used an aggregation strategy based on users: we merged tweets from the same user on the same day to create synthetic documents. The rationale behind this is that users will likely be coherent in what they tweet, on the same day, given that the initial data collection already outlines a thematic frame. For the aggregated documents, we set a lower limit of 50 tokens.⁶ This is still comparably short for LDA but allows us to include a larger proportion of users. We also excluded documents over 1,000 tokens, since these would most likely to be comprised of automated and repeated tweets. Using this strategy, we could include 24.85 % of all tweets, representing 8.5 % of all users. As a result of this, the long tail of users who tweeted only a limited number of tweets on the subject were excluded. This trade-off between completeness and computability allows us to capture major topics but is biased towards more active users. This has to be taken into account when interpreting the results.

- (2) The second approach concentrates on the emoji themselves and their semantic content. Based on the idea of distributional semantics that the meaning of words can be derived from their context (see Fabre & Lenci, 2015, for an overview), vector space models of semantics have recently become more popular. Word-based models enable the empirical study of the semantic similarity of words based on word use in a given corpus. Vector space models thus provide an operationalization of the intuitive

⁶ A token is generally a word, but in our case, it also includes emoji.

idea of a “semantic space”, in which words are arranged in proximity based on their semantic similarity. Such models represent individual words as vectors in high-dimensional space, often having a hundred dimensions or more. While such high-dimensional spaces go beyond our usual notion of two- or three-dimensional spaces, they are based on the same algebraic concepts and allow capture of semantic nuances in a computational manner.

In this spirit, vector space models are a promising approach to study the usage and meaning of emoji. This was first undertaken by Instagram’s engineering team (Instagram Engineering, 2015). Based on data from the Instagram photo sharing service, semantic information about emoji could be obtained. This was applied for emoji interpretation: since emoji are characteristically open for different interpretations, their similarity to non-emoji words in vector space can help to establish dominant interpretations of emoji in the corpus under study. Barbieri et al. (2016) applied a similar methodology on tweets from US users.

For this paper, we created our own word vector model based on the collected tweets in the English language. Different computational approaches have been proposed to derive a vector space representation for words within their context. An established algorithm is word2vec (Mikolov, Chen, et al. 2013; Mikolov, Sutskever, et al. 2013). We calculated a model with 100 dimensions using the implementation for the Python programming language available in the software package gensim (Řehůřek & Sojka, 2010).

Results of the Twitter Analysis

Topics and Their Dynamics over Time

The topic model allows us to analyze how words (and emoji) are regularly used simultaneously and arrange recurring discourses that unfold over time. Taking a step back and analyzing the dynamics between these topics allows us to see how the conversation (in the English language) concerning Notre Dame unfolds on a meta-analytical level. We identified a total of 16 topics (see also Appendix 1).⁷

Figure 2 shows how the topics evolved during the seven days following the fire and shows that some topics only dominate the debate on specific days, i.e.,

7 Deciding on the optimal number of topics is always a difficult issue with LDA. To decide on an optimal number, we calculated topic models for 12 up to 20 topics and used a combination of manual and automated evaluation using coherence measures (Röder et al., 2015).

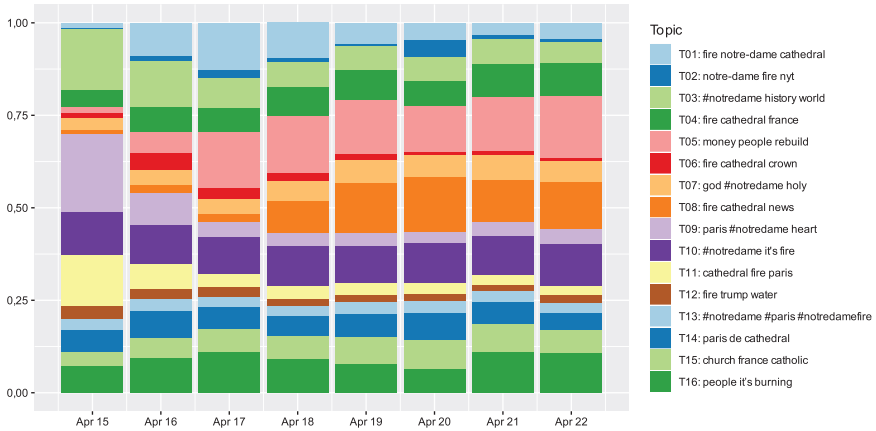


FIGURE 2 Evolution of topics

their presence increases or decreases significantly in the course of the analyzed period, while other topics accompany the discussion more or less consistently. These topics will be briefly outlined below because they structure the field of discussion as a whole and its thematic strands in detail.

Topics 3, 9, and 11 have a strong presence at the beginning of the discussion but then decline. These topics reflect the initial reactions during and shortly after the fire itself, with slight differentiations: Topic 9, which is initially the most present topic, declines most rapidly during days two and three, reflecting emotional attitudes towards the fire in the cathedral the most. Characteristic words here are “sad” and “heartbreaking”, and it is also the topic with the most emoji. The topic also shows how much the emotions are linked to personal experiences with the building, especially with visits to Paris or in recollecting these visits.⁸ In many tweets, these emotions are also related to the people with whom one has visited Notre Dame. A typical tweet is: “Once I visited Notre Dame with my fiancé to show her the beauty of the world outside her town. I am shocked about what happened today, but glad I had the chance to walk those stairs”.⁹

8 Since the topic model is based on the English sub-corpus, these recollections of visits to Notre-Dame often reflect the perspectives of international tourists. A comparative analysis of the French sub-corpus would allow further insights into the perspective of French citizens (see “Limitations and Outlook”).

9 In order to protect common users, we do not quote individual tweets, but paraphrase them in a way that keeps pace with the original sentiment as closely as possible. The exception is celebrity users with a high visibility or institutional accounts.

Topic 3 is also dominant at the beginning and decreases similarly fast. Here, the focus is on the manifold meanings that the building represents independently of the twitterers' visits and experiences: as a cultural heritage site with a historical dimension, as an architectural masterpiece, as a beautiful building, as a container of art, and as a religious building. This topic also contains many tweets from official accounts, such as Barack Obama's ("Notre Dame is one of the world's great treasures, and we're thinking of the people of France in your time of grief. It's in our nature to mourn when we see history lost – but it's also in our nature to rebuild for tomorrow, as strong as we can"). Such tweets mention the broad array of different aspects of Notre Dame's cultural heritage, such as architecture, art, religion, and history, and in that way, they can equally address a diverse range of religious as well as non-religious followers. Topic 11 is also present at the beginning and then rapidly diminishes. These tweets refer in particular to the architectural structure, discussing the (potential) collapse of the towers, the roof, and the interior, and the anticipated or actual loss due to the flames. This topic also consists to a large extent of news headlines reporting on the state of destruction.

Thus, in the topics that structure the field at the beginning, it is noticeable that religion is not a dominant topic. Rather, it is the acute destruction of a building to which individual emotions and memories are attached, a building that has several meanings and serves a variety of functions, including symbolic functions.

Topic 1 and 5 only increase between the second and fourth day¹⁰ and deal with the reconstruction of Notre Dame, which is particularly present in the media debate in the first few days after the fire because of two facts: President Macron's promise to rebuild the Cathedral within five years, and the rapidly piling up of millions of donations from wealthy individual donors and companies. Topic 5 further discusses donations and their amount, also in relation to other causes. For instance, a pastor writes in a tweet "The incident of the Notre Dame fire shows how quickly money can be raised. The money is there to fight poverty, but the rich prefer to spend it for other things".

Two further topics reach their climax on a single day: topic 6 is especially strong on the second day, and topic 2 on the sixth day. Topic 6 deals with the relics in the cathedral, in particular the crown of thorns, whose salvation by a chaplain was announced on this day in several news media. The narrative here

10 The same is true for topic 8; however, this specific topic is difficult to interpret, since it consists of a mixture of various news topics on the fire, including the French "yellow vest" movement, the survival of the bees that lived in Notre Dame Cathedral, and the suspicion that a "computer glitch" could have caused the fire.

above all celebrates its salvation and its saviors as heroes, while hardly discussing the religious significance of the relics. However, this can also be explained at least partly by the fact that the tweets in question usually (only) consist of the headlines of associated news articles. Topic 2 seems intuitively difficult to understand, but a glance at the respective tweets reveals that they are related to important and often-read background articles, predominantly from the *New York Times* (as indicated by the token “nyt”), which are shared time and again.

The topics 4, 7, 10, and 12–16 remain roughly the same over the course of time. Topics 4, 7, and 15 each are related to religious topics and take up about the same amount of space in the debate – they never dominate the field of discussion but are always present. Topic 4 includes tweets with conspiracy theory appeal, especially discussing whether the Cathedral fire was an attack from a radical Muslim background or not. Tweets from this topic claim that Muslims were happy when the fire broke out and point out alleged other, failed plans to attack the cathedral. Topic 15 in turn covers the thematic field in which the “Notre Dame fire” is placed within the context of interreligious, especially Christian–Jewish, relations. This includes, on the one hand, more conspiracy tweets that interpret Notre Dame’s architecture with its gargoyle sculptures as a sign of satanic influence in Roman Catholicism, sometimes linking it to anti-Semitic tropes or tweets allegedly reporting Jewish reactions to the fire (such as interpreting it as compensatory justice for the burning of the Babylonian Talmud by French Catholics). Other tweets explicitly address anti-Semitism and question references to a Judeo-Christian heritage, e.g. “No-one should use ‘Judeo-Christian’ when referring to Notre Dame. It was built in a time of persecution of Jews in France”.

Topic 7 describes a thematic field that revolves around the cores of Roman Catholicism. Central words here are “god”, “holy”, “church”, “jesus”, “pray”, “easter”, “christ”, “faith”, “lord”, “cross”, “mary”, “mass” et cetera as well as the emoji “🙏”. This topic comprises tweets that represent religious or faith communication in the narrow sense, i.e., commenting on or classifying the events from an internal Roman Catholic perspective. This includes, for example, a whole series of tweets that suggest praying for the fire to stop and also directly performing, i.e., writing a prayer as the tweet. See, for instance, the tweet of the Pope: “Today we unite in prayer with the people of France, as we wait for the sorrow inflicted by the serious damage to be transformed into hope with reconstruction. Holy Mary, Our Lady, pray for us. #NotreDame”. We found that responses to this tweet frequently followed patterns like: “Amen. We pray for the people of Paris. Holy Mary, Our Mother, pray for your children”; or, “Holy Mary, pray for us. St Joan of Arc, pray for us. God Bless Pope Francis, Donald Trump and all our Leaders. Guide us in the name of Jesus! #NotreDame”.

In particular, religious interpretations are attached to the image of the cross in the sanctuary, which apparently survived the fire unspoiled: “The Cross is illuminated and stands out from ashes and darkness. Its light tells us not to stop hoping. The Lord is our hope. #NotreDame will be built again, for the Lord makes all things new”. Topic 7 also includes a variety of tweets that draw on Bible quotations in order to interpret what is happening. Further tweets interpret the fire as a sign, especially for the near expectation of Judgment Day. Religious narratives are used here to interpret the events, to pray, and to express hope for the reconstruction of the Cathedral. Finally, this topic also contains tweets announcing church services or memorial bell chimes with reference to Notre Dame.

The remaining topics will be discussed here only briefly and cursorily: Topic 10 collects some diverse meta-reactions to the fire, such as discussions of fake photos and recordings from security cameras; topic 12 deals with US President Donald Trump’s famous tweet on the fire of Notre Dame, which, showing a lack of knowledge of safety procedures, recommends the use of fire-fighting planes to the Paris fire brigade. Topic 13 consists exclusively of hashtags and thus groups tweets that comprise mainly collections of hashtags but do not convey any further content. Topic 14 focuses once again specifically on the cultural-historical dimension of the Cathedral, here with a focus on the history of literature and architecture (e.g., by referring to the novel by Victor Hugo). Topic 16 compiles a meta-discourse on reactions and follow-up discussions in the context of the Notre Dame fire; here, for example, it is about the legitimate extent of mourning in comparison to the destruction of other cultural heritage or brings up postcolonial criticism of France.

Emoji Use

A first impression of the usage of emoji in reaction to the Notre Dame fire can be obtained by looking at the most frequently used emoji. The ten most frequently used emoji in the data are: ❤️ (36,528), 😞 (32,807), 🙏 (27,846), 🇫🇷 (17,911), 😊 (14,565), ❤️ (13,578), 🙏 (13,006), 😞 (8,745), 🔥 (8,582), and 😞 (7,532). Figure 3 shows the 20 most frequently used emoji. The three by far most used emoji – ❤️, 😞, and 🙏 – express sadness over the event. Still, in the top ten is an emoji with a religious connotation: 🙏.¹¹ The top 20 also includes the 🏰 emoji, reflecting the Cathedral as an object of conversation.

The order of the most used emoji is surprisingly stable across languages, as the comparison between English and French tweets in Figure 4 shows. We can

11 The emoji is included twice in the top 20: once with the default symbolic yellow skin tone, once with the light skin tone modifier.

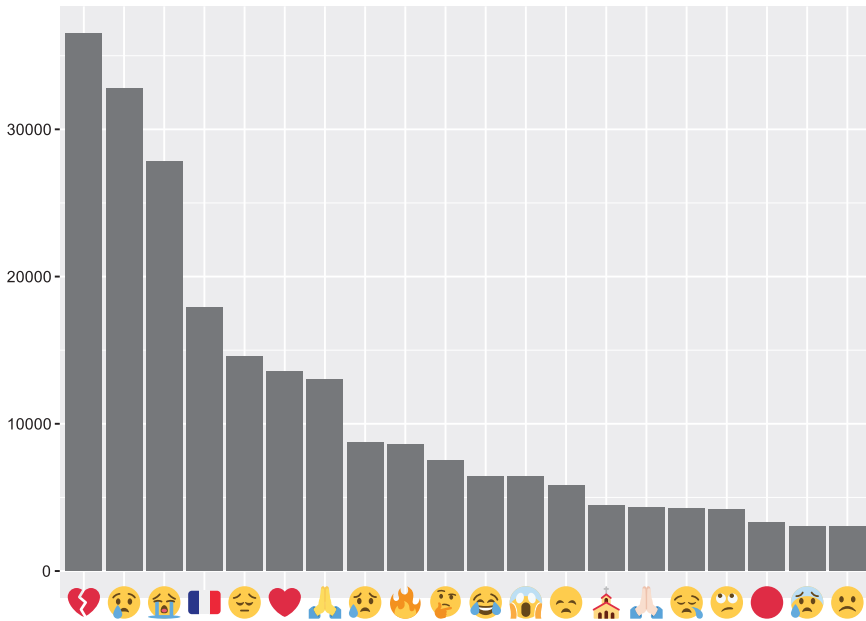


FIGURE 3 Most used emoji

see some features of emoji use that seem to be specific to one linguistic group. For example, the symbolic emoji 🇫🇷 and 📌 are much more frequent in French tweets, where they are used to highlight breaking news and links. However, the general patterns are comparable, so we will refrain from reporting per-language results below.

In terms of general occurrence, the frequent use of 😞 and 😓 might be surprising, since their sentiment seems to counter the dominant expression of sadness and grief. Here, looking at the temporal dimension of emoji usage proves to be useful (Figure 5). The graph shows the relative frequency of emoji usage per day, i.e., the number of times an emoji is used divided by the number of all emoji used on that day. Here, the ten emoji with the highest change during the course of time are selected, as many emoji show no strong dynamic pattern.

From the plot, we can distinguish three major patterns. In comparison, two emoji, ❤️ and 🇫🇷, are used with no significant difference over the course of time, though they both reach their maximum on the day after the fire. Five emoji show a significant decline and are heavily used on the night of the fire itself, but then quickly are used less frequently. This is the case for 💔, 😓, and 😭, and to a lesser extent also for 😞 and 😞. These emoji seem to be associated with the immediate reaction to the fire and express sadness and grief. This also shows how emoji are not fixed in their meaning but are reinterpreted depending

Emoji en	N	Emoji fr	N
💔	14892	😞	8066
😞	11248	😞	7508
😞	8509	💔	6849
🇫🇷	7086	🇫🇷	4661
❤️	6015	🙏	4576
😞	4996	❤️	3747
🙏	4835	😞	2921
🔥	3228	😞	2217
😞	2752	🙏	2154
😞	2562	😞	2061
😞	2400	😞	1918
🙏	1604	🔥	1848
😞	1540	🇺🇸	1519
🕌	1353	➡️	1383
🙏	1339	🙏	1365
😞	1316	🕌	1135
😞	1247	😞	1094
😞	1232	😞	986
🙏	1175	😞	934
⚡	1048	😡	919

FIGURE 4 Comparison of emoji use in English and French tweets

on the cultural context. The official definition of 😞 according to the Unicode standard is “Disappointed but Relieved Face”. However, in the context of the given tweets, it is most probably used to express not relief but sadness.

Finally, the third major pattern is formed by the emoji 😞 and 😞. They show a strikingly similar dynamic: they are hardly used on the evening of the fire, but then rapidly increase on days two and three, from where they remain relatively stable and remain among the most used emoji. This demands an explanation because especially the laughing emoji contradicts expectations one might have regarding the dominant sentiment in the light of the event. Why are these emoji becoming so popular when time passes? Looking at the contextual meaning of the emoji using a vector space model of the English sub-corpus allows us to identify other emoji, hashtags, and words that occupy similar positions in the semantic space.

As shown above, the most frequently used emoji was ❤️, especially in the first days after the fire. In the vector space model of the English sub-corpus, it

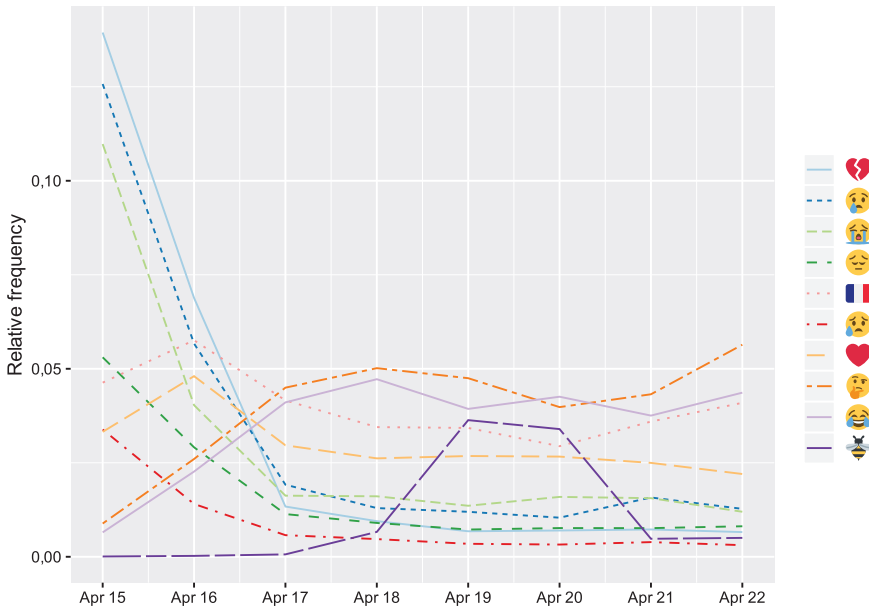


FIGURE 5 Emoji usage over time

has the highest semantic similarity with other emoji that express sadness (see Figure 6). This finding is plausible, as writers might substitute one of the emoji for the other and express roughly the same feeling.

This result confirms our intuition. The model can therefore be used to examine more ambiguous emoji or those whose meaning is less clear. For the emoji 🤔, we find expressions like “hmm”, but also the hashtags #qanon (for QAnon) and #maga (for Make America Great Again) as well as the word “coincidence”. These hint at US American right-wing conspiracy theories that are particularly popular among supporters of Donald Trump (Bank et al., 2018). This link to conspiracy theory is expressed in tweets like “How did Notre Dame catch fire? If they aren't sure yet, why did they rule out arson or terrorism? 🤔 Hiding something?”

The most frequent used emoji with an explicit religious meaning is 🙏. But while it can be read as hands folded in prayer, this is not its only use. The Unicode standard describes it simply as “person with folded hands”, and it is used to represent a variety of actions and interactions, from greetings and thank you to prayer and even high five (Kelly, 2019). Considering the role of religion in the discourse on Notre Dame, we examine the semantics of the emoji in our corpus. The most similar tokens are shown in Figure 7.

Word	Similarity
	0,8820913
	0,8092721
	0,7821237
	0,7057400
	0,6839105
	0,6529683
	0,6264346
	0,6180243
	0,5980746
	0,5891477

FIGURE 6 Closest semantic neighbors for emoji

Word	Similarity	Non-Emoji Word	Similarity
	0,9017198	xx	0,6576657
	0,8599479	#prayfornotredame	0,6113850
	0,8223011	blessings	0,5753251
	0,7793821	#prayforparis	0,5675770
	0,7718439	#ligue1	0,5657400
	0,7695986	amen	0,5475272
	0,7275957	#prayersfornotredame	0,5305822
	0,7228627	#prayersforparis	0,5277650
	0,7182963	#prayers	0,5237688
	0,7142851	#hailmary	0,5185796

FIGURE 7 Closest semantic neighbors for emoji

We see that two base emoji are dominant here in different variants: First is the “folded hands” emoji with different skin tones.¹² Second, the “heart” emoji in different colors also shows a high semantic similarity. Both of these findings do not really clarify the specific use of this emoji. Furthermore, the emoji also hints at a religious interpretation. This is confirmed by looking at the most similar tokens that are *not* emoji themselves. Here, a lot of hashtags appear that include the word pray, e.g., #prayfornotredame, #prayforparis, or

12 The similarity of the folded hands emoji with and without various skin tone modifiers shows that the different skin tones express the same base meaning, as they are very close in meaning to each other. However, the similarity decreases the darker the skin tone gets. This suggests that the unmodified yellow skin tone seems to be close to the light-toned

#prayersforparis. The interpretation of the emoji as praying hands therefore dominates the corpus. At the same time, it hints at a certain practice of expressing compassion: posting the emoji, or using a hashtag like #prayfornotredame, is a kind of speech act that performs the prayer by stating it. Interestingly, this practice blends seamlessly with less religiously framed expressions of care and sympathy: the heart emoji and the character combination “xx”, which is a common symbol for “kisses”, occupy a similar semantic space without sharing the religious connotation.

The emoji 🙏, in contrast, possesses much stronger religious semantics. It appears not only as a close neighbor of 🙌, but also in topic 7, which is the topic explicitly linked to Roman Catholicism. Its most similar emoji and non-emoji neighbors, which both show strong religious connotations, are shown in Figure 8.

The characteristics of the word2vec model allow us to look at the meaning of the folded hands emoji that remains when it is stripped of its religious connotation. When subtracting the semantic vector of the cross emoji from the folded hands emoji, we can see a different semantic emerge (see Figure 9). Similarity to efforts, hoping/hope, and firefighters hints at a secondary meaning that is not religious prayer (although praying and pray still appear in the list), but rather the expression of hope. This might be understood as a secularized notion of the folded hands: one expresses hope for a desired outcome, without necessarily referring to a divine entity.

When looking at the architectural dimension of emoji usage, one of the most frequently used emoji in the corpus is the “church” emoji 🏰. In considering its semantic neighbors (Figure 10), three major patterns become visible: First, other emoji that can be used as visual substitutes rank high, e.g., “synagogue” 🕌, “wedding chapel” 🏰, and “European castle” 🏰. Looking at corresponding tweets, these are usually not used in correspondence with their canonical meaning, but as visual representations of the Notre Dame Cathedral. This hints at the technological affordances of current input technologies: emoji input systems, e.g., the virtual emoji keyboards on mobile devices, show the emoji graphic without any verbal description. Thus, the synagogue emoji can quickly be mistaken for a church. Also, on current Android devices, the synagogue emoji features two prominent towers and a rose window, which resembles

variant, while the medium-dark tone is used a bit differently. This hints at a racial bias in emoji usage: the “unmodified” variant is not actually neutral but rather expresses an “implicit whiteness” (see Sweeney & Whaley, 2019). However, the differences are not large, showing a general consensus in the usage of the “folded hands” emoji.

















Word	Similarity	Non-Emoji Word	Similarity
	0,8664925	amen	0,7122109
	0,8623866	#godisgood	0,6913344
	0,8367437	#holythursday	0,6898260
	0,8356897	#jesussaves	0,6850983
	0,8288914	#prayersfornotredame	0,6766676
	0,8209012	#amen	0,6741836
	0,8205863	xx	0,6689136
	0,8186662	#prayforparis	0,6624342
	0,8149344	#holytuesday	0,6613541
	0,8067166	#prayforfrance	0,6494018

FIGURE 8 Closest semantic neighbors for emoji  (all words and non-emoji only)

Word	Similarity
Efforts	0,4215128
Hoping	0,4213115
Hope	0,3902090
Firefighters	0,3688848
Praying	0,3599485
Hopefully	0,3554051
Pray	0,3532493
Recovery	0,3499988
Emergency	0,3469096
Prayers	0,3406141

FIGURE 9 Semantically similar words to vector  minus 

Notre-Dame’s architecture more closely than the church icon does (see Figure 11). The same reason might be behind the choice for the castle emoji.

Second, iconic symbols related to France and its national identity appear prominently in the list:  (officially named “Tokyo Tower”, but obviously repurposed to represent the Eiffel Tower, which lacks its own emoji) and “fleur de lis” . Third, emoji linked to religion and especially religious practice appear in the list: , , , and .














Word	Similarity
	0,8806790
	0,8754339
	0,8189400
	0,8180067
	0,8028944
	0,7965053
	0,7806444
	0,7715330
	0,7696065
	0,7622184

FIGURE 10 Closest semantic neighbors for emoji 



FIGURE 11 Emoji representations on Twitter and Android platforms

Discussion

The Notre-Dame fire was intensely discussed on Twitter, and emoji played a significant role in expressing emotions and attitudes related to this event. The corpus of collected tweets provides a valuable data source to study characteristics of the discourse in general, and also the role religion plays. The different analyses clearly show the high emotional activity on Twitter in the hours and days after the start of the fire. This immediate reaction is visible in the number of tweets, which peak on the evening of the fire itself, in the dynamics of the topics, and in the most frequently used emoji. The dominant topic on the first day also includes a high number of emoji, most prominently , , and . They support the expression of shock and sadness and add a second layer to the linguistic verbalization. Religious references are not predominant in the initial reactions to the fire. Rather, the earliest tweets during the fire and shortly afterward predominantly mourn the loss of cultural heritage, including references

to individual memories and associated emotions. This confirms the findings of research on the significance and meaning of religious architecture, in that it invokes all the different levels that a place of worship also – and apparently primarily – represents within a broader public debate: as an architecturally and art-historically significant building, as a representative of cultural values (whereby some topics here clearly show how these are also critically discussed), and only subordinately as a place with religious functions (Olsen, 2013, pp. 46–47; Freyer & Behrens, 2013, p. 200; Allensbach, 2009, pp. 15–18, 39–41). It also shows how important famous churches are in their function as tourist destinations, and how visitors associate specific emotional experiences with their visits in the medium and long term (Voase, 2007; Lewicka, 2008).

With respect to religion-related symbols, one of the most frequently used emoji is the folded hands emoji 🙏. Its semantic analysis shows that it is primarily used with the meaning of “prayer”, but its use remains in an ambivalent space between religious and secular expression. On the one hand, it is related to hashtags like #prayfornotredame and the “cross” emoji ☩, which are less ambivalent with regard to religious connotation (see below). In some cases, it is also used in the context of tweets that are written in the style of a prayer. Here, the folded hand emoji can even be interpreted as symbolizing a physical movement/posture, signifying the enactment of a Christian prayer and thereby representing a variant of a speech act. At the same time, the model shows a high similarity to the “heart” emoji ❤️ and the code “xx” (kisses), which both can serve as a general sign of affection and compassion. Consequently, the emoji 🙏 does not always hold a specific religious meaning but rather shows an ambivalence that may simply mirror the diffusion of certain religious practices into a popular culture in post-traditional societies in general (e.g., Knoblauch, 2009). It can be interpreted as a quick prayer, as an expression of hope for a desired outcome (e.g., related to the efforts of the firefighters), which is not necessarily directed towards a deity, but also highlights the performative aspect of emoji use. In contrast, the related emoji ☩ is clearly less ambivalent in its religious semantics. It is related to tweets that are obviously written from an internal Christian position and interpret the events accordingly, and it is unambiguously related to other Christian symbols and hashtags. Again, this may mirror the range in which some symbols belong more clearly to the brand core of Christian religions, while others are more withdrawn from their domain, a diagnosis which can be found in analyses of mediatized religion in general (see among others Hjarvard, 2008).

Religion also enters the Twitter discourse from another angle: two of the identified topics, 4 and 15, establish interreligious references, on the one hand, the

relationship between Christian and Jewish traditions, and, on the other hand, Christian–Muslim conflicts. Here the embeddedness of the debate becomes quite clear in yet another manner: the embedding of the Twitter discussions in broader societal debates. The Notre Dame fire, indeed, recalls existing discourses, especially on Muslim terrorist attacks in Western countries or on Christian buildings. This resonates with the aforementioned literature on emotions and religion on Twitter (Papacharissi, 2014; Dahmen et al., 2018; Kraidy, 2017; Mitchell, 2006; Döveling et al., 2018; Ge & Gretzel, 2018; Stark & Crawford, 2015), even if in this case there is no connection between the Notre Dame topic and Islam or Muslims. This suggests that the fire might have triggered the outpouring of narratives about religious identities. In view of the destruction of an important Christian church, it is obviously not sufficient to claim a certain position within, for example, the Christian tradition, but the event is also (mis-)used for drawing upon typical anti-Muslim discourses. The emoji that reflects this line of thought most prominently is the “thinking face” emoji 🤔. In many cases, it is directly associated with conspiracy theories that question the official information, e.g., about the source of the fire. Here, the analysis reveals part of the dynamics of social media that enable the spread of false information and racist narratives.

At the center of the discourse, we investigated Notre Dame Cathedral as an iconic building. The Twitter data show a variety of ways in which people refer to the building. The use of emoji to express grief and mourning shows several common denominators with regard to the meaning and functions such a structure has for people all over the world: the sense of loss for a structure that is highly appreciated first and foremost for its architectural and art historical significance. Moreover, on a more affective level, personal experiences and memories with regard to the building come to the fore. The architecture itself is also represented through emoji, with the “church” emoji 🏰 (or similar-looking building emoji) being frequently used. The semantic analysis shows two usage patterns: the church is related to other symbols of French national identity, namely the Eiffel Tower and the fleur de lis. The link to a heraldic symbol and a modern, secular structure emphasizes the importance of the cathedral as a secular identity marker. At the same time, the church emoji is close to the emoji 🏠/🏡 and 🏩, highlighting the performative dimension of religious practice that is embedded in the built religious space.

Our study gave insight into the dynamics of contemporary social media discourse in the wake of an exceptional event. Our results are in line with other research in the field of religious buildings, showing that emotions play a role that may not be underestimated when a religious building is threatened. The overall willingness, aside from some critique addressed in this article, to rebuild and donate money for this aid underscores the fact that religious buildings represent more than the stones of which they are built.

Limitations and Outlook

The Twitter data are a rich resource for studying contemporary communicative practices. However, analyzing such a vast data source also creates its own problems. The methods applied in this paper utilize unsupervised machine learning to reveal embedded patterns in language use. However, they require a set of choices (e.g., search terms, preprocessing, document aggregation, number of topics/dimensions), and they have an inherently probabilistic element. As a consequence, the results of the analysis are not easily reproducible, let alone “objective”. We regard them more as a heuristic device that provides one interpretation of the data that can then stimulate and contrast our own hermeneutic interpretation.

Also, the limited space of this paper requires us to leave out some potentially interesting aspects of the data. The focus on the English sub-corpus in the computational analyses highlights the perspectives of an international demographic (and French users writing in English). This underemphasizes the specific significance of Notre Dame as a national monument for French citizens. Especially the comparison of the English language models with the French sub-corpus would be a worthwhile future direction for research. We believe the combination of computational and qualitative analysis to be a fruitful addition to the methodological toolbox of researchers studying religion and media. This paper sheds light on some crucial aspects on the role of religion in public media discourse and opens the door for further research in this direction.

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