Author Queries & Comments:

Q1 : The reference "Jackson, 2020" is cited in the text but is not listed in the references list. Please either delete the in-text citation or provide full reference details following journal style.

Response: Change to Jackson et al., 2020 (which is in reference list)

Q2 : The reference "Isa & Himelboim, 2018" is cited in the text but is not listed in the references list. Please either delete the in- text citation or provide full reference details following journal style.

Response: Isa, D., & Himelboim, I. (2018). A social networks approach to online social movement: Social mediators and mediated content in# freeajstaff twitter network. Social Media+ Society, 4(1), 2056305118760807.https://doi.org/10.1177/2056305118760807

Q3 : The reference "Hansen, 2020" is cited in the text but is not listed in the references list. Please either delete the in-text citation or provide full reference details following journal style.

Response: Should be (Hansen et al., 2020) in text and Hansen, D., Shneiderman, B., Smith, M. A. & Himelboim, I. (2010). Analyzing social media networks with NodeXL: Insights from a connected world (2nd edition). Morgan Kaufmann https://doi.org/10.1016/C2018-0-01348-1 .

Q4 : The CrossRef database (www.crossref.org/) has been used to validate the references. Mismatches between the original manuscript and CrossRef are tracked in red font. Please provide a revision if the change is incorrect.

Response: yes

Q5 : Please provide the span of dates on which the conference/proceedings/meeting was held for the "Bruns and Burgess, 2011" references list entry.

Response: Proceedings of the 6th European Consortium for Political Research (ECPR) General Conference 2011, University of Iceland, Reykjavik. 24-27th august -

https://ecpr.eu/Filestore/Files/Publications/ConferenceProgrammes/Programme_GeneralConference_2011.pdf

Q6 : Please provide missing DOI, if available, for the "Caleffi, 2015" references list entry.

Response: no Doi, Available from http://www.skase.sk/Volumes/JTL28/pdf_doc/05.pdf

Q7 : Please provide missing DOI, if available, for the "Gretzel, 2017" references list entry.

Response: No DOI

Q8 : Please provide missing issue number for reference "Jordan and Weller, 2018" references list entry.

Response: Jordan, K., & Weller, M. (2018). Academics and Social Networking Sites: Benefits, Problems and Tensions in Professional Engagement with Online Networking. Journal of Interactive Media in Education, 2018(1): 1, pp. 1–9, DOI: https://doi.org/10.5334/jime.448

Q9 : Please provide missing page range for reference "Jordan and Weller, 2018" references list entry.

Response: Jordan, K and Weller, M 2018 Academics and Social Networking Sites: Benefits, Problems and Tensions in Professional Engagement with Online Networking. Journal of Interactive Media in Education, 2018(1): 1, pp. 1–9, DOI: https://doi.org/10.5334/jime.448

Q10 : Please provide missing volume number and issue number for reference "Mura and Wijesinghe, 2021" references list entry.

Response: None available yet - https://www.tandfonline.com/doi/full/10.1080/14616688.2021.1925733

Q11 : Please provide missing DOI, if available, for the "Neumayer et al., 2016" references list entry.

Response: None Available. Available from https://ijoc.org/index.php/ijoc/article/view/5424

Q12 : Please provide missing volume number and issue number for reference "Screti, 2021" references list entry.

Response: Not available yet - https://www.tandfonline.com/doi/full/10.1080/14766825.2021.1966024

Q13 : Please provide missing volume number and issue number for reference "Yuval, 2021" references list entry.

#overtourism on Twitter: a social movement for change or an echo chamber?

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ABSTRACT

When the linguistic innovation and phrase overtourism was used in an online news report to describe excessive tourism in Iceland in 2016, legacy and social media soon following with in-depth articles and visual representations of perceived excessive tourism in other locations around the world. Given the growing calls for action on overtourism, this study takes a social network analysis (SNA) approach, using a network analysis and visualization software package called NodeXL Pro, to better understand the 10,325 tweets which used the hashtag 'overtourism' between July 2013 and September 2020. By exploring central users, conversation starters, gatekeepers and influencers, the analysis indicates that an ad hoc network was built around #overtourism on twitter. The analysis indicates that this network is held together by a small number of experts, who play a key role in presenting, distributing and circulating information about this controversial topic. While the studies practical contribution is the use of NodeXL Pro for advanced social media network analysis, the findings also indicate that the ability of these experts to influence perceptions of overtourism inside and outside twitter will depend on whether it can engage broader publics as the tourism sector recovers from a global pandemic.

KEYWORDS

- overtourism
- social media
- hashtag analysis
- social network analysis
- #overtourism
- Twitter

Introduction

Social media has changed global communication, with citizen access to the Internet providing many around the world with the ability to express their opinions and interact with others. Scholars are only beginning to explore how social media users can influence others through social networks, and whether users are creating the asymmetric power needed to influence social structures and public opinion. When twitter was launched in 2006 by Francisco-based podcasting company Odeo, it was a short messaging service (SMS) for groups, rather than the social networking platform of 330 million monthly active users we know today. Twitter users could express themselves in 140 characters (increased to 280 in 2017) and from 2007, could also search for topics using joined words, abbreviated or word groups called hashtags (i.e. #mytopic). Hashtags aid ongoing conversations and allow for ad-hoc networks (communities, publics) to emerge (Bruns & Burgess, 2011; Rambukkana, 2015a) by threading 'conversations, people, and movements together' (Jackson, 2020**[Q1]**, p. XXVIII). As individuals come together through shared causes, grievances, intentions and political objectives, the crafting, deployment and amplifying of hashtags (Rambukkana, 2015b) can lead to collaboration and collective action without centralized supervision. These networks are often tied to contemporary news, politics and events, where there is an evident need for quick and effective governance, with networks (e.g. #MeeToo) having wide impacts on people, programs, projects, policies, strategies and partnerships.

Overtourism, as a phrase, did not possess a pre-discursive identity or enter the world fully formed in 2016, when a Skift.com reporter used it in a report on excessive tourism in Iceland (Sheivachman, 2016). While Skift argue they coined the phrase (Ali, 2018), others argue the phrase was in circulation prior to 2016 (Milano et al., 2019a). The two conjoined words, rather than permanently linked to excessive tourism in Iceland at a specific time, soon took on more a broader geographic meaning. It became established through its application to other destinations and contexts, given the phrase has a pragmatic function and is a clear and not unreasonable way of speaking about perceived negative impacts of excessive tourism on destinations. Grasped by those seeking to describe and explain the 'realities' of excessive tourism at a destination level, the phrase became a powerful nodal point, and following a campaign from the Telegraph newspaper, one of the Oxford English Dictionary words of the year in 2018 (Dickinson, 2018). The phrase framed tourism in some destinations as 'spiralling out of control' (Koens et al., 2018) due to the 'excessive growth of visitors leading to overcrowding in areas where residents suffer' (Milano et al., 2018). The United Nations World Tourism Organisation(UNWTO,2018, p. 4) describes overtourism as 'the impact of tourism on a destination, or parts thereof, that excessively influences perceived quality of life of citizens and/or quality of visitors experiences in a negative way'. Scholars identified the phenomenon worldwide, including Ljubljana (Kuščer & Mihalič, 2019), Munich (Namberger et al., 2019), Budapest (Smith et al., 2019), Barcelona (Bourliataux-Lajoinie et al., 2019), Berlin (Novy, 2017) and Montreal (Khomsi et al., 2020).

The phrase has all the morphological and syntactic features of a hashtag, in that it is an innovative linguistic formation, stringing two words together. Taken out of this context 'over tourism' would be a vague, simple statement. When used together, it takes on symbolic meaning and has evolved into mainstream language (Caleffi, 2015). While not syntactically formal and lacking grammaticality, overtourism acts like a tool of rhetorical protest, much like a slogan, to suggest too much of something. Following #MeToo, which was initiated by the black social justice activist, Tarana Burke, as the 'Me too' movement in 2006, (Jaffe, 2018), overtourism was not preceded by the hashtag #overtourism. However, just as 'Me too' became #MeToo, it is important to explore how a phrase like overtourism is represented and conveyed on social media platforms like twitter. Indeed, its swift rise to global attention in 2016 owes much to the fluidity of social media, twitter and hashtags. Zappavigna (2011) describes hashtags as 'searchable talk', and a means by which people 'actively render their talk more findable' (Zappavigna, 2011, p. 804). Hashtag's function both as a 'community-building linguistic activity' (Zappavigna, 2011, p. 789), and act as linguistic markers, with those who adopt the same hashtag engaging in collaborative tagging, to create ad-hoc networks. The #overtourism network is an important site of analysis, given it provides a lens into what many actors term a crisis, a movement and a global threat to destinations across the globe. To model the emergence of a new phrase, idea and hashtag, this study uses quantitative social network analysis (SNA), to calculate and explore the network structure within twitter, based on usage of the #overtourism hashtag between 2013 and 2020. The study will determine the key influential actors on twitter linked to the #overtourism hashtag and describe the degree distributions of the relationships between twitter users in the #overtourism twitter conversation. Utilizing NodeXL Pro as the SNA tool, the study conducts an SNA of 10,325 unique tweets to identify the central, prominent and influential 'players' in the network, before analyzing the findings to interpret the network characteristics.

Literature review

Having become integral to human interaction (Lu & Hsiao, 2010), social media is shifting how people initiate collective action. It is used by activists, social movements, marginalized groups and organizations to create and exchange content, disseminate information, build legitimacy, mobilize support, build networks and engage with key societal actors such as news media and policy makers, to prompt social, institutional, civic, organizational and political change by advancing counter-narratives (Mauro, 2020). Unlike other social networks, the follower structure of Twitter is non-reciprocal. That is, unless the account is protected, one does not need to wait for the approval of the account owner to follow a user (Page, 2012). Tweets are multifunctional, that is, they can be used to post an update or share a link or send a public message directed to another member (Page, 2012). While the '@' prefix signals another member's user account, any combination of characters led by a hash ('#') symbol, indicates a search term. Hashtags were originally user-led innovations and were subsequently integrated into Twitter's architecture 'as a metadata indicator aimed to coordinate discussions and simplify the finding, following, and listing of messages related to a specific theme' (Eriksson Krutrök &Lindgren,2018, p. 2). A hashtag used by itself or together with other hashtags can have a variety of effects. A hashtag can operate 'as a reflexive meta-commentary to express context around a given message' (Eriksson Krutrök & Lindgren,2018, p. 3), or exist merely as an affective amplifier (i.e. #happy). They allow for 'the direct communication of raw and immediate images, emotions, and ideas and their widespread dissemination in a way previously unknown' (Jackson et al., 2020, p. XXX), but also ambient affiliation, in that an individual using a hashtag may not know or interact directly with others who use the hashtag (Zappavigna, 2015).

Hashtags are now central to everything from presidential actions (Stolee & Caton, 2018), celebrity self-branding (Page, 2012) and social movements (Conway et al., 2015). A hashtagged word, phrase or sentence can raise awareness of an evolving topic of interest, issue, political or social claim, stimulate action and test taken for granted socio-cultural norms, dominant frames and powerful actors (Yang, 2016). It can influence how 'both those on the margins and those at the centre engage in sociopolitical debate and meaning-making' (Jackson et al., 2020, p. xxvii). From #OccupyWallStreet in 2008 #JusticeForTrayvon in 2013 to 'Twitter Revolutions' such as the Iranian Green Movement in 2009–2010 (Schradie, 2019), there has been a growing debate about the role and impact of hashtags. Despite tourism being one of the world's largest economic sectors and responsible for 1.5 billion international tourist arrivals in 2019, few hashtags which problematize tourism or seek to redress inequalities within tourism have become omnipresent or durable symbols for activism or comment. Becken et al. (2021) explored #flightshame, and its spread from its original appearance in Sweden, while Gretzel (2017) explored #unfriendlyskies and travel, tourism and hospitality-related activism on social media. Ram (2021) investigated the impact of #MeToo in the tourism and hospitality sectors, while several studies explored #Cecilthelion, after Cecil the Lion was killed in Zimbabwe during 2015 (Macdonald et al., 2016; Mkono, 2018). Generally, hashtag-related movements and moments related to tourism are rare, with few hashtags transcending localities and few global hashtags becoming repurposed for local contexts (Paredes-Rodriguez & Spierings, 2020).

While a hashtag can pre-emptively frame ideas, the temporal emergence of overtourism in 2016, led to 'hashtags ... frequent Google searches and dinner party conversations' (Dodds & Butler, 2019a, p. 1). The phrase became a discursive nodal point that 'enables everything that happens in this discourse to be situated' (Lacan, 1993, p. 268), with different actor's rallying around it, to make statements about tourism, and communicating their experience and knowledge about excessive tourism at specific destinations. The debate on overtourism has drawn in destinations, residents, policymakers, global institutions and tourists across the globe and has generated numerous media articles, books, policy documents, documentaries and syllabi (Screti, 2021). While these continue to enter discursive circulation, overtourism is represented and conveyed on social media platforms like Twitter, with the hashtag #overtourism (Insch, 2020; Sharma & Hassan, 2021). The hashtag acts as a point of reference for Twitter users, who otherwise might be unknown to each other, and allows them to share knowledge, stories, concerns, pictures and actions associated with excessive tourism and engage in conversations about the topic. As overtourism has a one-sided meaning, its presence demarcating an ideological, political, critical position or viewpoint about excessive tourism, a tweet with the hashtag provides a means of visibility, with the possibility of amplification, outreach and the creation of strong ties between users (Schradie, 2018).

Overtourism has been framed as a global 'crisis' (Cotterell et al., 2019; Higgins-Desbiolles, 2020; Yuval, 2021), with overtourism discourse drawing attention to practices of contestation such as resistance, dissent and other expressions of anti-tourism sentiment (Colomb & Novy, 2016; Martín et al., 2018; Milano et al., 2019b). Scholars and commentators believe that the overtourism 'threat' (Adie et al., 2020) is a global one and has forced people of varied cultures and circumstances to take to the streets in protests in locations such as Barcelona, Venice, Byron Bay, Kyoto and Budapest (Smith et al., 2019; Zerva et al., 2019). Critical tourism scholars argue that these protests reflect growing anti-tourism sentiment (Clancy, 2019; Frey, 2021), and constitute a global 'overtourism movement' (Cheer et al., 2019; Dhiraj & Kumar, 2021; Higgins-Desbiolles et al., 2022; Kim et al., 2020). Therefore, when #overtourism is used, shared, mentioned or replied to, an ad hoc social network is built, which can solidify into communities, movements, publics, identities and hubs (Bruns & Burgess, 2011). The hashtag can potentially make visible, the lived experiences of individuals in popular tourist destinations and helping 'people of varied cultures and circumstances to take an issue with international significance and make a splash in their own country, city or town' (Hill, 2013, p. 56).

Methodology and network characteristics

As social media networks become increasingly adopted by individuals, authorities and organizations, social media analytics has emerged as a research field, with theoretical and practical inquiries emerging on the basis that such networks contain rich and the dynamic data. As individuals form networks as they follow, reply, use hashtags and mention one another, Twitter contains network structures that can be extracted, analysed and visualized. Each tweet contains the foundation for SNA, which is a strategic, theoretical and methodological approach to explore social relationships and flows between people and other connected entities via the use of network and graph theories (Otte & Rousseau, 2002). SNA states social network structures and relationship in terms of nodes (an individual person within the network) and the edges or ties (relationships or interactions) that connect the nodes together (Pinheiro, 2011). As Twitter users 'file' their comments, they performatively frame what these comments are 'really about,' through the use of a hashtag and thereby enable users to indicate a meaning that might not be otherwise apparent. H (Bonilla & Rosa, 2015). For researchers, a hashtag can then serve as an indexing system, both in the clerical sense and the semiotic sense (Bonilla & Rosa, 2015).

NodeXL (Network Overview for Discovery and Exploration in Excel) Pro is licence-based application developed by the non-profit Social Media Research foundation. The application enables social network overview, content discovery and exploration and can generate useful network statistics, metrics and visualizations, including content analysis, sentiment analysis, time series analysis, text analysis and hashtag analysis. The application has become a reliable way to run an SNA of a hashtag (Table 1).

Table 1. Hashtag analysis studies using NodeXL.

Keib et al. (2018)	#BlackLivesMatter	Analysis of the hashtag linked to the decentralized political and social movement
Adalat and Niazi (2017)	#PanamaLeaks	Analysis of a hashtag linked to the Panama papers leak in 2016
Tremayne (2014)	#OccupyWallStreet	Analysis of the hashtag associated with the Occupy Wall Street protest movement
Hodges and Stocking (2016)	#nokxl	Analysis of the hashtag associated with the Keystone XL pipeline movement
Graeff et al. (2014)	#JusticeForTrayvon	Analysis of the hashtag that emerged after the death of African American teen Trayvon Martin

Using NodeXL, it is possible to quantifiably analyse the social network that forms among people who tweet the #overtourism hashtag. The Twitter dataset is formed by posts using the hashtag #overtourism on the social network Twitter over the 2632-day, 12-hour, 12-minute period from Wednesday, 17 July 2013 at 10:40 UTC to Wednesday, 30 September 2020 at 22:53 UTC. The dataset was commercially purchased to ensure accuracy and completeness. The graph represents a network of 5702 Twitter users whose tweets were included in a list (Tweet ID Overtourism List) of 10420 tweet IDs. 10325 out of 10,420 tweets were validated. There was no evidence of bots (short for social robots) or automated accounts, which might skew the data. Once the dataset was imported into NodeXL, it created a template in Microsoft Excel and integrated a library of common network metrics and graph layout algorithms within the familiar spreadsheet format. The application created a network graph and captured a range of qualities about the connection pattern of each user in the network through several network metrics. These include the number of people a user follows ('followed'), the number of users following a user ('followers'), and the number of tweets a user has created ('tweets'). In NodeXL, each 'node' is called a 'vertex', which denotes a user in the network, and an 'edge' represents a connection between two users (linking two vertices in a social network). There is an edge for each 'replies-to' relationship in a tweet, an edge for each 'mentions' relationship in a tweet, and a self-loop edge for each tweet that is not a 'replies-to' or 'mentions'. The network graph was laid out using the Harel-Koren Fast Multiscale layout algorithm, while the graph's vertices were grouped by cluster using the Clauset-Newman-Moore cluster algorithm.

Like most self-organized networks, the network is characterized by a highly skewed distribution of links or ties among the nodes (Isa & Himelboim, 2018**[Q2]**). The overall graph metrics (Table 2) suggest a network structure, with the number of edges suggesting connectivity between vertices or nodes. The average geodesic distance in this network is 4.898531 hops or steps, which is slightly longer than the average separation (node distance) of 4.57 on Twitter (Türker & Sulak, 2018). The maximum geodesic distance (diameter) separating the two most distance nodes in this network is 14. This means on average, the number of tweets to connect two users in the network is nearly 5. Graph density is the measure of the number of edges among a group of vertices over the total possible number, if everyone was connected to everyone. While high graph density means that most users are connected to many others, analysis indicates a low graph density of 0.000193642. This indicates that most user accounts are not connected to many others, and the network has many users who lack any connections at all (called 'isolates') (Hansen et al., 2010). The overtourism topic attracts a fragmented Twitter population who tweet about the topic, but not to each other. Another important measure is the modularity score, which can identify the strength of division of a network into clusters. Networks with high modularity (with a maximum modularity score of 1) have dense connections or edges between the nodes within communities but sparse connections or edges between nodes in different communities. The modality score of the #overtourism network is .0386. This is a relatively low modularity score, meaning users are forming a network that is mostly inter-connected, rather than partitioned between groups of users.

Table 2.

Table 2. Overall graph metrics of #overtourism.

Vertices	5758	Reciprocated edge ratio	0.064496027418601
Unique edges	6826	Connected components	1820
Edges with duplicates	9551	Single-vertex connected components	1514
Total edges	16377	Maximum vertices in a connected component	3424
Number of edge types	3	Maximum edges in a connected component	13026
Tweet	6555	Maximum geodesic distance (diameter)	14
Mentions	8829	Average geodesic distance	4.898531
Replies to	993	Graph density	0.000193642
Self-loops	6555	Modularity	0.386522
Reciprocated vertex pair ratio	0.033322601416613		

Analysis

Influence and network analysis results

This section reports on the characteristics of every vertex, based upon in-degree and out-degree (Table 3), betweenness, eigenvector centrality and PageRank (Table 4). The in-degree centrality score is a count of the total number of connections linked to a vertex. The number of 'In-degree' links can indicate the extent to which a user's tweets are retweeted by others or when a user is mentioned in others' tweets. Often, those with high in-degree scores are the conversation starters in a network and can connect 'isolates' (those with few or no links to other users in the network). While an average in-degree centrality is 1.535, which is the average number of tweets received per user, @skift has an in-degree centrality of 162. Skift, which claims to have coined the phrase overtourism, is a travel industry news site but also provides market research and marketing services to the travel sector. It has posted original #overtourism news and stories, with network analysis also finding that skift.com is the top media domain link (496) contained in the dataset. Other media-linked conversation starters include Condé Nast Traveller, the New York Times and CNN Travel. The list also includes the World Tourism Organisation (UNWTO), which launched a report on overtourism in 2018(UNWTO,2018), and the World Travel Market –London, which had overtourism panel sessions in 2017 and 2018. Responsible Travel (@r_travel), a self-labelled 'activist travel company' established in 2001 is also an important conversation starter and is responsible for producing an overtourism documentary film. Russo and Koesten (2005, p. 256) also note that actor's prestige (in-degree) also 'represents the degree to which others seek out a particular actor in a social network,' @airbnb had over 42 arrows pointing towards them, as a small number of users called them out in their tweets and pointed to their responsibility in the phenomenon of overtourism. The findings indicate that the attempt to draw in @airbnb by using the @ (mention) option was not amplified (Hodges & Stocking, 2016).

Table 3. In-degree and out-degree scores.

Minimum in-degree	0	Minimum out-degree	0
Maximum in-degree	162	Maximum out-degree	234
Average in-degree	1.535	Average out-Ddgree	1.535
Median in-degree	1.000	Median out-degree	1.000

@skift	162	@susttourism	234
@unwto	78	@umanitea	116
@r_travel	59	@genxtraveler	113
@cnntravel	53	@jolocktov (Author of @dreamofvenice)	96
@airbnb	42	@dreamofvenice	95
@justinmfrancis (CEO of @r_travel)	39	@voyagervicki	92
@wtm_london	38	@jmcheer1	79
@cntraveler	36	@drstephenh	69
@nytimes	36	@glpfilms	52
@overtourism	34	@fdimanche (A)	49

Table 4. Betweenness centrality, betweenness centrality and PageRank scores.

Betweenness centrality		Betweenness centrality		PageRank	
@susttourism	2583210.879	@susttourism	0.021	@susttourism	67.665
@skift	2138041.036	@skift	0.012	@skift	40.708
@unwto	1486979.767	@justinmfrancis (CEO of @r_travel)	0.009	@genxtraveler	30.011
@Justinmfrancis (CEO of @r_travel)	987251.1403	@r_travel	0.007	@umanitea	28.292
@r_travel	889393.6635	@unwto	0.007	@dreamofvenice	23.871
@Glpfilms	852524.5915	@traveltf	0.007	@voyagervicki	23.455
@Umanitea	744082.7064	@jmcheer1	0.005	@jolocktov	22.360
@cnntravel	688830.8423	@fdimanche	0.005	@jmcheer1	20.097
@jmcheer1	679906.1511	@overtourism	0.005	@unwto	18.621
@Traveltf	610564.4357	@davidjarratt1	0.005	@terrtourisme	17.342

Out-degree is the number of connections that originate at a vertex and point outward to other vertices. It is an indication of the ability of the account to tweet a lot about a topic, and their ability to reach users' attention by mentioning or replying to them. The top two accounts are critical tourism scholars. The third #GenXTravel is a Travel Writer/Blogger, who has explored and debated overtourism with followers, and has organized, for example, a #overtourism Twitter chat month. JoAnn Locktov, with the 5th highest out-degree centrality score is an American author who launched a publishing imprint for books about Venice in 2014 and is critical about tourism in the city. Betweenness centrality measures the extent to which a certain vertex lies on the shortest paths between other vertices. In other words, it helps identify individuals who play a 'bridge spanning' role in a network by acting as a bridge between users (Hansen, 2020[Q3]). The accounts with the highest betweenness centrality highlight the extent to which they are conduits and brokers for information flow and transmission inside the network. Without these accounts, information flow would be severely disrupted. The user @susttourism, who is a consultant and academic, has the highest score, followed by Skift and the UNWTO. The eigenvector centrality network metric takes into consideration not only how many connections (followers) a vertex (account) has (i.e. its degree), but also the centrality of the vertices that it is connected to. Describing eigenvector centrality, Borgatti and Everett(2006, p. 471)

note that a central actor is one who 'knows everybody who is anybody' as opposed to 'knows everybody'. Intuitively, it considers not just 'how many people you know,' but also 'who you know' (Hansen et al., 2010, p. 84). Users with a high eigenvector score are more likely positioned in the 'centre' of interactions and are considered to have a high-information spreading power. The user @susttourism has the highest score relative to others. Other accounts with high scores, such as @skift, @r_travel and the @unwto, are information providers and rarely seek out information (few out-degree links). The analysis finds most accounts have low eigenvector centrality scores, suggesting that they may be somewhat peripheral accounts within the broader Twitter network.

PageRank is a variant of eigenvector centrality and can also be used as a metric of influence, As the PageRank algorithm assigns weightage to each node based on the quality of the incoming edges towards it rather than quantity, it can identify users highly endorsed by surrounding actors. By indicating reliability and trust of an account, it can reveal the influencers who influence other influencers. Analysis finds that @susttourism is perceived as most authoritative by others in the network. Top mentioned (Table 5) accounts are ranked by how often usernames appeared in the collected set of tweets (excluding the times their username started a message which is classified as a reply). Top replied to users are ranked by how often their usernames appear in the first part of a collected set of tweets (excluding the times their username appeared elsewhere in a message, which is classified as a mention instead). The top two replied to accounts are voices against excessive tourism in Venice.

Table 5. Top mentioned and top replied-to in entire graph.

@skift (286)	@jolocktov (33)
@marinanovelli73 (127)	@umanitea (26)
@unwto (126)	@travlyng (16)
@claudiomilano10 (125)	@nomademma (15)
@cnntravel (96)	@over_tourism (13)
@r_travel (79)	@dipyourtoesin (11)
@susttourism (68)	@dreamofvenice (10)
@justinmfrancis (66)	@avoidcrowds (10)
@tomyellowrail (60)	@holledge (10)
@wtm_london (56)	@travlyng (16)

In addition to the basic act of sharing content, one way #overtourism contributors amplified the messages of excessive tourism was by use of additional hashtags (Table 6). The top two supplementary and semantically related hashtags were #tourism and #travel. Other hashtags stacked to #overtourism were #sustainabletourism, #sustainability and #responsibletourism. These examples illustrate the dual significance of hashtags, with additional hashtags acting as discursive markers to increase the visibility of a message, and as a device to convey additional meaning (Türker & Sulak, 2018). While semantically unrelated, location hashtags mentioned in association with #overtourism included the European destinations of Venice, Amsterdam, Edinburgh and Barcelona. Venice is important, not only because of the key contributions of two user accounts with high out-degree centrality scores, but also because Venice has been the primary example used by critical tourism scholars and news media to illustrate the negative impacts of tourism since the 1980s (Bertocchi et al., 2020). Table 6 also shows the world pairs that connect overtourism to travel and tourism. They also signify that although the #overtourism hashtag is new, it is also linked to previously discoursed hashtags such as #sustainabletourism.

Table 6. Top additional hashtags and top word pairs in entire graph.

[1606] tourism	[356] #tourism, #overtourism
[1484] travel	[276] #overtourism, #travel

[732] venice	[206] #travel, #overtourism
[476] sustainabletourism	[204] #travel, #tourism
[311] sustainability	[174] #overtourism, #tourism
[232] responsibletourism	[172] over, tourism
[231] amsterdam	[144] cruise, ships
[209] edinburgh	[127] #overtourism, #sustainabletourism
[202] barcelona	[121] #venice, #overtourism

Discussion

There is every reason to be alarmed about tourism and its contribution to climate change, pollution and quality of life in destinations across the globe, with strong motivations for people and communities to be vocal about negative tourism impacts. Twitter is a public interface with the potential to call attention to those impacts, build support and demand change. It is a platform where counter-discourses can be deployed and orchestrated by social movements and activists to challenge dominant discourses and narratives. The viral reach of the #MeToo around the globe, for example, drove changes in laws around the world, and enabled new conversations in homes, lecture halls and boardrooms about sex and power (Chandra & Erlingsdóttir, 2020). As a way of interpreting reality at the destination level, the use of #overtourism is a call for attention, as it invites others to consider it, utilize it by retweeting, and comment on what they perceive to be true about excessive tourism. While the hashtag drew 5758 users, the network is characterized by a high degree of centralization, with many of the same user accounts appearing across measures. Mimicking the universal properties of real networks, the power-law distribution on Twitter is evident, with a small number of users conveying and controlling the flow of information, resulting in a concentration of knowledge and influence. Unlike the 'opinion leaders' from the era of broadcast media (Jin, 2020), these users are not traditional gatekeepers with the largest audiences. These scholars, consultants and bloggers (Table 7) are 'experts' because they have followers, are viewed as experts and knowledgeable about the topic, and can exert social pressure (Dubois & Gaffney, 2014) by engaging other Twitter users and journalists from high-volume, highly trafficked and highly ranked news sites such as Reuters and the New York Times. There is an evident spillover effect (Meyer & Whittier, 1994) with an analysis of traditional media websites (URLs) in the dataset often using quotations from these experts, and therefore providing the topic with legitimacy and connecting the experts to readers who otherwise might not be aware of excessive tourism.

Table 7. Core users in entire graph.

Academics	@Susttourism – Prof. Rachel Dodds, Director of Sustaining Tourism, @Umanitea – Prof. Johan Oosterman, @jmcheer1 – Prof. Joseph Cheer @fdimanche – Prof. Frédéric Dimanche, @marinanovelli73 – Prof. Marina Novelli, @ClaudioMilano10 – Prof. Claudio Milano, @overtourism – Academic Account, @terrtourisme – Prof. Pierre Ageron, @drstephenh – Dr. Stephen Harwood
News media/bloggers	@skift – Media company that provides news, research, and marketing services to the travel industry, @cnntravel – CNN Tavel, @cntraveler – Condé Nast Traveler, @nytimes – New York Times
Consultants	@Susttourism – Prof. Rachel Dodds, Director of Sustaining Tourism, @Glpfilms – Content marketing agency dedicated to sustainable tourism, @Traveltf – non-profit, working with businesses and governments to maximize the benefits of tourism, @voyagervicki – Vicki Mattingly, Voyager Vicki Consulting, @tomyellowrail – Tom Buncle, MD, Yellow Railroad international destination consultancy
Travel companies	@Justinmfrancis – Justin Francis, CEO Responsible Travel, @r_travel – Activist travel company, Responsible Travel

Bloggers and writers	@nomademma – Blogger writing about remote work and travel, @dipyourtoesin – Food and travel writers/photographers, @holledge – Environmentalist (Edinburgh), @*GenXTraveler* – Travel Writer/Blogger
Institutional accounts	@unwto - The World Tourism Organisation is the United Nations specialized agency, @wtm_london – The World Travel Market is an annual event for the global travel industry

While analysis indicates that new media accounts such as Skift and institutional accounts UNWTO have high influence as information providers, these accounts rarely seek out information and engage others on the topic (fewer out-degree links) (Jin, 2020). However, mere followership of a node (user account) is not a full indication of social capital and influence. Those with high in-degree centrality scores can be thought of as conversational hubs, since other users have replied to, mentioned, or retweeted their posts. Prof. Dodds is a Professor in the School of Hospitality and Tourism Management at Ryerson University in Canada, and owner of the consulting firm Sustaining Tourism. She is also an author of influential books and articles about overtourism (Dodds & Butler, 2019a, 2019b). Her high out-degree centrality score reflects high tweeting and re-tweeting activity and outreach and engagement, as she initiates contact with others about the topic by mentioning or replying to them. While Prof. Dodds is the influencer who influences other influencers, she is primarily a seeker and transmitter of information. By stepping into the topic foreground and occupying centre stage on Twitter, she joins other experts with high betweenness centrality and out-degree scores who determine which news, produced by various scholars, newspapers, destinations groups, etc. get tagged with #overtourism.

Overall, low-degree nodes dominate the dataset, indicating that users are not significantly connected (Table 2). The reciprocated vertex pair ratio of the network is 0.033322601416613, meaning that only 3 out 100 users had a mutual communication about the overtourism topic. The reciprocated edge ratio, which is the percentage of edges that have a reciprocal relationship is 0.064496027418601, which means that there are only 6 reciprocated relations (mutual connections) in every 100 relations in the network. Rather than signifying an overtourisn or anti-tourist movement (Cheer et al., 2019; Clancy, 2019; Frey, 2021; Kim et al., 2020), or act as a barometer of how people feel about excessive tourism, there is no evidence the hashtag manifests itself coherently in destinations identified as suffering from overtourism, or indicates the existence of local, national, or transnational movements, coalitions, clusters or groups gathering coherently to acknowledge or engage with the topic. In addition, there is no clear evidence the topic drew in those with discursive and transformative power, and who might have material effects in boardrooms, the legislative or in popular culture. There is a relatively little activity from political leaders, celebrities, tourist boards, government officials, tourism businesses or grassroots organizations. Given hashtags have an audience-selecting role, the self-selected reception of those who coalesce around the hashtag, share content, and engage with it, while allows others to opt out of the discourse and choose not to listen.

While the experts (Table 7) differ in the number of connections with other users (e.g. attracting more links pointing inward from others and/or generating more links to reach other users), they all have a demonstrative background in the tourism sector. Tourism scholars are key nodes in the network graph and score highly in many of the network measures. The analysis identifies their significant role in spreading knowledge as they maintain and amplify overtourism discourse. Given the hashtag is not a neutral term but a carrier of what some critical tourism scholars think, believe or feel it to be the truth about excessive tourism in destinations around the globe, the hashtag can contribute to building and maintaining scholarly identity, help promote one's work, secure funding and allow them to reap the benefits of membership in a networked community of fellow scholars (Jordan & Weller, 2018; Mura & Wijesinghe, 2021; Singh, 2015; Skilbrei, 2021). As they are trusted on the topic and are perceived to have expertise, they also help shape the discourse unfolding in interconnected communication spaces, such as edited books, lecture halls, journal special issues in journals and conference sessions.

However, the analysis identifies a large gap between experts and other users. Somewhat trapped in their own discursive formation (O'Regan et al., 2022), a weakness is that the network is dominated by what some may describe as an overtourism industry, containing western consultants, academics and activists who profit as go-betweens and 'allies' in the service of destinations stakeholders' groups, with varying degrees of sincerity (Tufekci, 2014). The network is not stable, given its dependence on a small number of key accounts. A decline in activity of one of these users could disconnect most users and interrupt information flow, with COVID-19 showing the temporality of hashtag circulation. The hashtag appeared once every year between 2013 and 2015, before it took off in 2016 (54), 2017 (1329), 2018 (3426), and peaking in 2019 (5022), before falling away in 2020 (1460) as COVID-19 emerged. Experts, made up of critical tourism scholars, consultants and journalists, who by engaging in a process of discovery and knowledge production about the 'truth' of excessive tourism, hope to engage the dominant forces of law, corporate forces and the media that exert the control over dominant tourism

discourses, and from which the tourist system arises, and shift political, tourism and dominant public discourses employed in the promotion and management of tourism. While experts are free to engage in digital activism, business and scholarly promotion, this study points to a large disparity between these experts and average users and influential ones in civil society, political and tourism industry circles. The promise of a hashtag such as #overtourism lies in the possibility of uncoupling it from academics, consultants and formal organizations, and giving it to anyone impacted by excessive tourism, so that it might transition to include the private sphere, resident associations, NGOs, politicians, and local academics and activism groups. Without proactive hashtag-related dialogue and conversations, based on 'common purposes and social solidarities, in sustained interaction with elites, opponents, and authorities' (Tarrow, 1994, p. 9) the topic may further decline on Twitter. Transitioning from unidirectional knowledge transfer approaches to drawing in a plurality of voices, histories, personal stories and expertise (Ruhanen et al., 2021) might help cultivate conversations and achieve the network density, reciprocal ties and true conversation (Neumayer et al., 2016) that produces experts and leaders at a destination level and serve as the building blocks for larger-scale 'connective action' (Bennett & Segerberg, 2013).

The study shows the potential of using corpus-based hashtag datasets and NodeXL Pro to identify the influential and important users behind evolving topics that are said to represent bottom up, non-elite destination stakeholder engagement and the views of destination residents. The significance of the study shows the significant role of experts, who, by broadcasting information, may be potentially overstating the support and engagement in the topic by wider publics. Indeed, the study shows that a centrality of experts in the network, possible hierarchy and the lack of dialogue with other actors or bridge influence with relevant organizations at destination level may hinder engagement with the topic at grassroots level.

Conclusion and future research

Overtourism transcended its emergence in relation to excessive tourism in Iceland and became universalized due to its general applicability and global relevance. The study, with which sought to identify the central, prominent and influential 'players' in the network, before analysing the findings to interpret the network characteristics, found that the #overtourism network is driven by a small number of influencers, network builders, and information providers and conversation starters, who help facilitate the flow of information in the network. Future study might use data from a variety of social media networks into a single study and analyse hashtags from local destination campaigns. Future research may also reflect on how the experts in this ad hoc #overtourism network may match their offline network and whether the online network led to the creation of a new network, in terms of collaboration and scholarly output, etc.

Disclosure statement

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