

# Mobile app for promoting cultural heritage: geostatistic and textual analysis

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**Abstract** – This study presents an innovative technological solution, applied to the promotion of both tangible and intangible cultural heritage of the Salento territory (an Italian sub-peninsula).

For the itinerant folk music festival called “La Notte della Taranta”, in 2015 an official mobile application called FolkTure, was been used by tourist and citizens during the entire period of the itinerant event (August).

Through the application of gamification strategy, augmented reality solutions and multimedia contents, FolkTure app facilitated and stimulated the enjoyment of the event itself and encouraged tourists and citizens to visit the Salento cultural heritage mapped inside the app.

The data extracted from the mobile FolkTure app was analyses and interprets through an innovative approach. Text analytics techniques, like semantic and sentiment analysis, integrated with spatial analysis techniques, allowed to identify sentiment score spatial variation and locate geographical area characterized by negative or positive average sentiment score, in order to understand the impact of a cultural event on the local territory.

## I. INTRODUCTION

The Cultural Heritage is wide, and it is difficult to find an exhaustive definition, comprehensive of each aspect. The first aspect the most of us think of, talking about cultural heritage, is the “tangible” one, such as historic sites and buildings and other artefacts, worthy of preservation for the future of the human civilization.

The natural environment is also a basic side of the heritage, and includes both landscapes, flora, fauna, and geological, paleontological and morphological elements. Together with the architectonic and artistic legacy of a place, such elements are the target of cultural tourism. However, there is another type of heritage deeply characterizing a culture: it has a non-physical nature, and it is called “intangible cultural heritage” [1]

As stated by UNESCO, “Cultural heritage does not end at monuments and collections of objects. It also includes

traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts” .

Intangible heritage is particularly difficult to preserve. In fact, this specific aspect of the culture is characterized by the urgency to save and disseminate some of the most peculiar intangible artistic expressions, especially those at risk of disappearing. This happens because these cultural expressions have been passed down mainly through imitation and oral tradition. Actually instead, new technologies can play a role in fostering their preservation and documentation.[2] One of the most evident expression of this type of heritage is the cultural event. According to the AIEST definition, the “event” is a unique and organized experience, with a specific aim (public or private) [3]. Each event is unique, also if it is repeated over time, because it never has the same characteristics.

The cultural events are a specific kind of events, and comprise art, music and theatre, but also enogastronomy (so popular today). Specifically, these events can be dedicated to a specific form of art (e.g.: Festival of Comics); a specific place (the italian “Sagra”, an event focused on a particular local product); a traditional sacred events (e.g. the celebration of the patron saints or the main religious calendar events, like Christmas); a Folk Music Festival, expression of the local history and traditions (e.g.: Celtic Music Festivals).

Festivals and special events play a significant role in communities' lives, because they provide important activities and spending outlets for both locals and visitors, and enhance the tourist image of local communities and their social cohesion. [4]

In particular, Festivals play an important role for the regions they refer to. They contribute significantly to cultural and economic development and may have a strong impact on the development of cultural tourism to the host communities. The festival organizers generally use the local historical and cultural themes to develop

periodical events that attract visitors and create a specific cultural image in host territories. The hosting of events is often developed for tourist and economic opportunities they provide, beside the social and cultural benefits. Festivals are one of the most impressive expression of the relationship between identity and place and support the raise of the civic consciousness. They are a strong evidence of human activity and contribute significantly to the social and cultural life of their host communities. [5]

To collect and analyse “real time” fruition evidences from the cultural events, technology can offer new opportunities, new connections, until recently inconceivable. Technological innovation made possible the development of a social form based on reticular infrastructure, where each individual is able of generating contributions that can immediately reach a global audience, potentially anyone with an internet connection. The key role in this process is precisely constituted by the evolution of the Web in Web 2.0.

Immersive tools such as augmented reality have a strong potential to support the experiencing of cultural heritage by the large public, complementing the current practices based on tangible goods such as museums, exhibitions, books and visual content. [1]

The social data, once acquired, analysed and interpreted with the right means, can become a precious source of information for all the stakeholders involved in the management of the event. If based on knowledge, these data enrich the cultural corpus of documentation on the intangible heritage underlying the event; if based on perceptions and emotions, they give crucial indications to event planners and managers. Such contributions can enhance the cultural event fruition, preserving the local community lifestyle and heritage and improving user experience of the event.

The case study of this work is the Apulian cultural event known as “La Notte della Taranta”, a music popular festival, culturally and socially significant, involving thousands of visitors and residents in the Salento territory in the month of August.

Data were extracted by a mobile application (“La Notte della Taranta” app) specifically created to promote the event and involve citizens.

“La Notte della Taranta” app is a product of the FolkTure Project of the University of Salento, funded by the Italian Ministry of Education, Universities and Research.

This application allow users to share information and multimedia material. It implements solution of navigation for cultural points, gamification dynamics and functionality of social networks.

Correlation analysis, geostatistics and text analytics techniques, like semantic and sentiment analysis, are applied to understand the impact of a cultural event on the local territory, measured through the topic of discussion identification and in terms of sentiment spatial

distribution of web texts published by users in the FolkTure app.

The next section describes the impacts of a cultural event on the strategical territorial growth and the methods of analysis and interpretation of web data related to the fruition of the event. After the technical description of the FolkTure application, we discuss about the correlation, geostatistics and text analytics techniques used for analysis of the case study presented. The main findings demonstrate that information derived from the collection and analysis of heterogeneous data originating from the FolkTure app can be precious for evaluating the real impact of the event, from the cultural, economic and social points of view.

We conclude with possible future directions to encourage this methodological approach to the event management, in order to better understand the potential of the event, its strengths and weaknesses, the real opinion of the reference target and the significant spillovers in the territory in economic and tourist terms.

## II. BACKGROUND

Cultural events have a purpose or objective and, hence, intended, desired and predicted (and, on occasion, unanticipated) outcomes. Although the importance of these events is clear, there is controversy over the best ways to measure their impacts on the people attending them, the organizers, the bodies offering related services and the host community. [6]

According to Porter [7], cultural events can improve significantly the quality of life of the area involved, and promote the regional development, becoming a decisive factor in whether a company establishes a new plant or research unit in a particular area rather than in another. Moreover, cultural events can help different economic activities. For example, by attracting in its belonging area visitors who will spend money in local shops, restaurants, hotels, etc. [8]

Many studies focus on the short-term economic benefits, neglecting that the event leaves a lasting impression to the people involved, often stronger than the economic short-term impacts (e.g. enhancing tourist’s attachment to a place, that leads to multiple visits and ah higher overall value). The host communities may also strengthen its pride of belonging, which can help to alleviate future eventual municipal costs. [6]

At the same time, the literature shows some critical aspects, mainly linked to the different types of impact. Indeed, from a general point of view, many authors argue that the massive exploitation of cultural assets can bring to social and spatial distortions [9], [10]. This seems to be true when cultural resources are considered just only as means targeted at achieving commercial purpose and not as key assets to promote and valorize the territorial identity of a place and its values. [11] [12] [13]

Burdge and Vanclay [14] defined social impacts as “all

social and cultural consequences to human population of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society”.

Digital technologies enhance the way people can enjoy cultural heritage. Technology can digitally reconstruct artefacts, landscapes or events, broaden the accessibility of culture through remote distribution platform, let people learn interactively about culture, augment the visit to a museum, efficiently organize visitors’ flows and so on. [15] ICTs can play an active role in both cultural event management and fruition data collection also through the implementation of innovative engagement strategies like the Gamification logics and the social networks (SNs).

In the last years, Gamification and serious games arouse the interest of both academic and business world. It is defined as the usage elements belonging to the game world, e.g., badges, rewards, competition, leaderboards, etc., in non-gaming systems, with the purpose of making people more engaged in completing a specific task or reaching a goal.

According to Deterding et al. [16], gamification is an informal term that comprises a range of strategies to exploit the power of these elements in different systems, to improve user experience (UX) and user engagement. The introduction of ‘gamified’ applications to large audiences, during the last years, will enable the enhancement of the existing rich research on the heuristics, design patterns and dynamics of games and the positive UX they provide.

The system designer has studied game aspects as potential means to shape user behaviour towards specific aims. [17]

It is clear the great deal of potential enclosed within this engagement strategy, applied in the cultural context in general, and related in particular to the fruition of events. Instead, about communication exchanges of people, the growth of Information and Communication Technologies (ICTs) has changed greatly the ways in which people connect among themselves and with the surrounding world.

Through the disclosure of information of public interest, the promotion of local events the publications of their views in SN or mobile applications, citizens become engaged and active, not passive, [18], [19], [20] for the construction of their own services. The community contribution in the decision-making process can have important benefits on regional planning [21].

Recently, numerous studies have focused their attention on social network messages related to events [22], [23] [24] and have used mathematical models to analyse web text, through extraction of semantic key topics [25], [26]. On the other hand, the Geographical Information System (GIS) allows representing on a geographical map some information of web users. Starting of sentiment

classification of web user posts, an innovative approach that use geostatistical techniques allows estimating the distribution of sentiment score in unsampled points. The strongly innovative topic allows to find only some studies in the literature, as [27] and [28] where have been explored the underlying trends in positive and negative sentiment score with respect to disasters and geographically related sentiment. The geostatistical tool integrated with GIS [29] can support the event management relatively to evaluation of alternative scenarios, planning for possible strategies and sustainable development.

### III. DESCRIPTION OF FOKTURE APP

In the FolkTure interdisciplinary project was been identified an innovative solutions for the fruition of the cultural heritage.

The official mobile application of the folk music Festival of the Italian summer, “La Notte della Taranta”, was designed and developed. This app, called FolkTure, was available, during the period of this itinerant event (August), on the main app stores (Apple Store and Play Store), and downloaded by thousands of users.

FolkTure app provided an extensive information system to plan a tour of the historical-cultural points of interest nearby each festival site, including visiting and opening times of such local facilities, gamification dynamics and functionality of social networks.

FolkTure’s specific purposes were the spread of the traditional intangible culture underlying the folk event, by creating a thematic online community around it, and the promotion of the local cultural heritage.

To facilitate the achievement of these goals, the mobile app implemented gamification logics. Gamification is an interdisciplinary approach that translates the specific elements of the games (points, levels, rewards, etc.) in not-playful contexts, to create engagement and promote positive behaviors. [16]

Gamification logics implemented inside the app were studied and defined to respond to requirements of innovation in cultural fruition and creation of a thematic community around the event and to encourage the creation of relevant contents within the community.

In particular, gamification rewarded some actions with points and badges. Earning points also gave the possibility to access a global ranking and compete in a main contest aimed at winning a VIP pass for the backstage of the final concert.

This naturally directed people’s behaviour towards actions “reinforced” by the gamification plan.

In order to gain points, users had to visit points of interest (POIs) such as monuments, churches and squares, near the event location. They also could discuss the event and the related cultural heritage on a public thread, called “Taranta Social”. Furthermore, they could find other users nearby and start private communications, through a

communication channel called “Taranta Messenger”, implementing a Facebook Messenger-like model.

The built-in Web and Mobile integrated service showed in **Errore. L'origine riferimento non è stata trovata.** was designed for geolocating point of interests and users, integrating browsing technologies for immersive reality and providing communication channels.

The IT architecture developed was built on back-ends and front-ends servlets, and relational and non-relational databases from five types: PostgreSQL, MySQL, Mongo DB, LDAP and SQL-Light.

An LDAP database centralized both Web and Mobile users authentication.

A dedicated database store information about each POI, such as GPS coordinates and multimedia contents. A servlet provided such contents to clients. Mobile users was able to reach POIs using GPS navigators embedded in their phones or Augmented reality.

Augmented reality overlaps computer-generated elements upon a live view of real-world environment. Those elements pinpoint physical place with a geolocated marker.

Each geolocated marker provided multimedia contents, such as photo, video and recorded commentary, supplying the discovering of the territory.

Metaio software solution, provided by homonymous company, was integrated in the FolkTure system, allowing users to see location-based markers in a 3D environment through smartphone cameras.

Additionally, this tool could overlay information such as text, images, video or 3D models on POIs.

The same tool enabled identification of nearby users through smartphone camera. This feature was underlying the social gaming model.

Real time mobile clients coordinates was written coordinates to a no-SQL database, exploiting built-in GPS sensor,

Social communications were provided by Cloud Parse, a “Backend as a service, BaaS” built upon Mongo DB customized according to project’s requirements. Cloud Parse store users’ settings, public posts and comments. Real time private chats were provided by an open source server XMPP called “E-jabberd”, allowing users to exchange peer to peer messages.

A dedicated MySQL database managed on-the-fly resizing and conversion of photographs uploaded by users, using “Chevereto” script, and made them available to clients.

Users’ scores and daily ranking were calculated on a daily basis, according to the gaming model underlying the platform.

A PHP script crawled all the needed information and wrote them on a first DB. After processing the results were then stored in the second DB. A dedicated servlet implementing an API service, exposed scores and rankings to clients.

#### IV. METHODOLOGY

The methodology approach consists of:

- correlation analysis to evaluate how much FolkTure app has successfully promoted the culture fruition,
- semantic classification to identify topics of interest in the event management,
- sentiment analysis to calculate the polarity of the text published on the mobile app
- geostatistical techniques to describe the sentiment score spatial variation, to support optimal sampling schemes and to predict the variable under study in unsampled points.

In order to investigate if there are specified geographical area characterized by negative average sentiment score of geolocated users, a prediction map using Geographic Information Systems (GIS) was applied.

The use of GIS guaranteed the possibility of integrating and representing citizens' opinions and assessments towards cultural heritage into an urban environment and making more effective decisions regarding the safeguard and promotion of the heritage. The predictive models based on the construction of geo-environmental patterns can be used to assist decision-making.

Correlation analysis measures the strength and direction of association that exists between two variables. In particular, Spearman’s rank correlation coefficient has been used. [30] [31] [32] This coefficient has been used to verify correlation between several metrics, and it is defined by:

$$\rho = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

with  $i$  being the paired score, where  $x_i$  and  $y_i$  are the ranks of users based on two different influence measures in a dataset of  $N$  users. The coefficient  $\rho$  is in the range  $[-1; +1]$ , in particular, if  $\rho = 1$ , it means that the two variables have strong positive correlation and they increase or decrease simultaneously. On the contrary, when  $\rho = -1$ , the two variables have strong negative correlation, indeed the variables increase or decrease in opposite directions. If  $\rho$  is near 0, it means there is no evident correlation between two variables.

To compare the correlation strength of different attribute pairs and since the sample dataset is large, a threshold value between 0.5 and -0.5 has been set and the correlation is significant at the 0.01 level (2-tailed).

The correlation analysis has been carried out by using the Statistical Package for Social Science (SPSS). [33]

Identifying the topic of web conversations about the “La Notte della Taranta” event reveals the main issues that citizens discuss on the web. Using Latent Semantic Analysis technique (LSA) [37] and K-Means algorithm [38], the word of web text are clusterized into different categories.

Concerning the sentiment score of web text published by users was calculated using an optimised unsupervised machine learning classifier. [36]

In order to investigate if there are specified geographical area characterized by negative average sentiment score, a prediction map using GIS was applied. This information can improve event communication, promotion and management strategies of the event on social channels.

Geostatistical techniques describe the spatial variation of the average sentiment score over the territory in which the event took place i.e. Lecce district (located in the South of Apulian Region, Italy) and its prediction at unsampled points through kriging [39]. To evaluate the sentiment score of the text published by users on “La Notte della Taranta” mobile app, an unsupervised SA algorithm was applied. A dictionary of classified words and a dictionary of modulators were the inputs to the algorithm. The output was a sentiment value between -1 (totally negative) and 1 (totally positive).

The integration of a GIS and Geostatistical tools can support the assessment of alternative strategies for improvement the planning and management of the event. One of main potentiality of Gis is to offer advanced functions to manage, storage and view of the same spatial or spatio-temporal data, which are geo-referenced on the territory under study. Indeed, the construction of a GIS project facilitates the data sharing and the integration of environmental, demographic data, as well as the results of spatial analysis. This innovative tool offers dynamic scenarios for monitoring and analysing different variables.

The FolkTure app supported the 2015 edition of “La Notte della Taranta” Festival for its entire duration in August 2015. The app corpus texts were taken from the app database.

In particular, App dataset consist of 2123 post. Among App post, 475 have geographical locations but only 129 of these have sentiment score. 84 have foreign geolocation and 682 have geographical locations in Italy. 106 users with Italian localization are located in the in Apulia Region, 95 of these in Lecce district. These sites correspond to the location of users when they made the last login to the app.

Therefore, the average sentiment score by “La Notte della Taranta” mobile App has been obtained in 95 places over Lecce district.

The spatial analysis of average sentiment score has been carried out by using the Geostatistical Analysis tool in ArcMap.

Ordinary kriging has been used to predict average sentiment score at an sampled site, on the basis of the following predictor:

$$\hat{Z}(\mathbf{u}) = \sum_{i=1}^n \lambda_i(\mathbf{u})Z(\mathbf{u}_i)$$

where the kriging weights (depend on the variogram

model and the sampling configuration.

## V. MAIN FINDINGS

To demonstrate that gamification dynamics implemented inside FolkTure app has successfully encouraged cultural interactions among users and promoted the culture fruition a correlation analysis was implemented. The correlation was calculated among "local knowledge", derived from the sum of check-ins at interest points, and “number of pictures posted into the App shows.

Users had to visit points of interest (monuments, churches, squares) near the event location, in order to gain points, and high correlation of Spearman’s rho [34] highlights this aspect.

In particular, the high correlation between "local knowledge" and “number of pictures posted into the App” (0.774) indicates that increasing the knowledge of the territory corresponds to an increase in the number of posts posted in the app.

Note that all georeferred messages and pictures (check-in) proved users really visited points of interest.

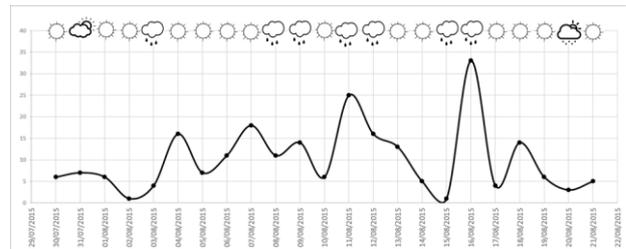


Figure 1: Daily number of check-in made by users near a point of interest, during August 2015.

We notice that gamification underlying the FolkTure app has successfully encouraged users to gain points, doing check-in and sharing georeferred texts and pictures, proving they really visited points of interest, in some case despite the weather conditions, as you can see from the Figure 1. By exploiting the potential of gamification strategy these dynamics, FolkTure mobile app encouraged users to explore the cultural heritage mapped inside the app. It refers to all the Points of Interest identified inside the towns hosting the Festival steps. These places are outside the classical tourist circuit, focused along the coasts, so generally they do not benefit from tourist flows, although they could potentially offer a rich and multi-faceted cultural heritage, both material and intangible.

The semantic analysis applied to FolkTure App texts identified two categories. The semantic category related to the event of “La Notte della Taranta” contains references to the concert, the music, the orchestra, and the event stages.

The second semantic category is more related to the web social aspects of sharing photos, texts, personal

information. In fact, FolkTure social platform is strictly linked to the need of storytelling: users, sharing the same passion, want to outline the history of their experience during the days of the Festival, witnessing their presence at the concerts, their emotions and their love for the traditions, the cultural and the natural heritage of this region.

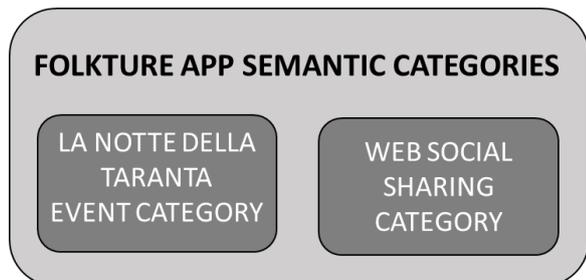


Figure 2: Semantic categories of FolkTure App.

To map on Salento territory the average sentiment expressed by users in the app, a geostatistical analysis was applied.

All users of mobile app have been georeferenced and stored in a GIS project, and they have been integrated with the environmental, demographic data and sentiment score.

The spatial analysis (Figure 3) shows that people involved are distributed overall territory of Salento, with a higher presence in the inland, an area not belonging to the main tourist circuits of Salento (coastal areas, Lecce etc.). Moreover, this type of analysis can show, in the case of an itinerant festival like “La Notte della Taranta”, which stages of the event show a greater participation and which, on the contrary, arouse little appeal and desire to share the experience in the public.

In order to estimate the spatial variation of the average sentiment score at unsampled points of the study area by using ordinary kriging method, the structural analysis has been performed on the measured values for App mobile sources of data.

After computing the sample variogram, the following spherical variogram model for “La Notte della Taranta” mobile App has been fitted:

$$\gamma(h)^A = 0.03 + 0.05 * shp(h, 1.8), \quad h > 0$$

where nugget and sill correspond to 0.03 and 0.05, respectively, while range is to equal to 1.8 Km.

The prediction map shows positive average sentiment score in the northwest and southeast of domain of interest and a neutral prediction in the rest of the Lecce district. The neutral average sentiment value is justified by the fact that app mobile was used to share information about semantic categories identified. Users provide information about the various stages of the itinerant festival, love to remember the cultural and historical aspects of their tradition and, through the app, share personal information (where you are, where go, weather forecasts).

The positive perception of the event (the north west and south east part of domain of interest), is related to a state of mind linked principally to the summer holidays and the beautiful places offered by Salento as well as by love for the “pizzica” and for the “La Notte della Taranta” event that all participants enjoy. These results are particularly encouraging for the event organisers.

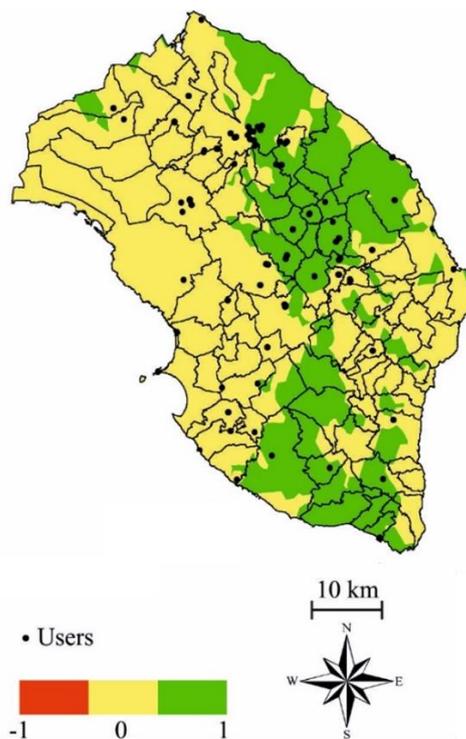


Figure 3: Spatial analysis and estimated average sentiment score by “La Notte della Taranta” mobile App

Finally, the cross-validation has been used to evaluate the goodness of the fitted model. The results in terms of mean standardized prediction error and the standardized root mean square error have confirmed the reliability of the model.

The prediction of the average sentiment score resulting by data from "La Notte della Taranta" mobile App, show that users are more involved in the event dynamics through the app functionalities. This result could validate the choice to use a mobile app to promote an event and it could encourage the organizers to continue to adopt mobile solutions that involve the users.

Finally, the integration of GIS and statistical techniques leads to the identification of areas with neutral sentiment score, useful to support the system of management event and for better planning of communication development. In fact, the indication of these aspects enables the event organizers to calibrate future planning strategies on the real needs and desires of the users, maintaining at the same time the successful aspects. In this way, they will

widen the catchment area of potential spectators and recover the cultural value of the Festival.

## VI. CONCLUSIONS

This paper aims to demonstrate that a mobile app, developed for a cultural event, “La Notte della Taranta”, facilitated and stimulated the enjoyment of the event itself and encouraged tourists and citizens to visit the Salento cultural heritage through augmented reality solutions and multimedia contents. FolkTure app takes advantage of augmented reality to support users looking for historical or cultural points of interest around.

Solution of gamification, augmented reality solutions and multimedia contents allowed addressing tourists towards the discovery of the inland treasures. Through storytelling and rewarding mechanics, the mobile application really succeeded in promoting the local cultural heritage and intercepting the tourist flows.

Correlation, geostatistics and text analytics techniques, has been proposed and applied in order to enables the event organisers to calibrate future planning strategies on the real needs and desires of the users, maintaining at the same time the successful aspects. This approach can help to recover and maintain the cultural value of an event, like “La Notte della Taranta” festival, culturally and socially significant for the Apulian territory. It demonstrated that gamification dynamics implemented inside FolkTure app has successfully encouraged cultural interactions among users and promoted the culture fruition.

Correlation analysis and analytic approach including semantic and sentiment meanings can be crucial for event organizers and all the stakeholders gravitating around it, because it evaluate the effectiveness and efficiency of communication and centralising bottom-up feedback and contributions.

Geostatistical analysis are particularly valuable in the context of the promotion and delocalization policies of tourism, because immediate acknowledgement of how an event or more generically a cultural attractor can magnetize the flows of tourists but also locals who have experience of their territory.

The proposed approach could be applied in other events. In the case in which the semantic analysis identifies other important aspects for the event management such as the urban planning or security, the geostatistics may identify their distribution on the territory. This will led to a significant improvement of the event management model.

## REFERENCES

- [1] M. Mortara, C. E. Catalano, F. Bellotti, G. Fiucci, M. Houry-Panchetti, and P. Petridis, “Learning cultural heritage by serious games,” *J. Cult. Herit.*, vol. 15, no. 3, pp. 318–325, 2014.
- [2] M. Ott, F. M. Dagnino, and F. Pozzi, “Intangible cultural heritage: Towards collaborative planning of educational interventions,” *Comput. Hum. Behav.*, vol. 51, pp. 1314–1319, 2015.
- [3] Aiest, *The Role and Impact of Mega-Events and Attractions on Regional and National Tourism Development*, Editions AIEST., vol. 28. St.-Gall, Switzerland, 1987.
- [4] I. Blesic, T. Pivac, J. Dordevic, I. Stamenkovic, and S. Janicevic, “Cultural events as part of cultural tourism development. Case study: Sombor and Apatin (Serbia),” *ACTA Geogr. Slov.-Geogr. Zb.*, vol. 54, no. 2, pp. 381–390, 2014.
- [5] R. Raj and C. Vignali, “Creating local experiences of cultural tourism through sustainable festivals,” 2010.
- [6] O. Moufakkir and T. Pernecky, *Ideological, social and cultural aspects of events*. CABI, 2014.
- [7] M. E. Porter, “The competitive advantage of nations,” 1990.
- [8] T. Tohmo, “Economic Impacts of Cultural Events on Local Economies: An Input—Output Analysis of the Kaustinen Folk Music Festival,” *Tour. Econ.*, vol. 11, no. 3, pp. 431–451, 2005.
- [9] T. Michailidis, “Mega—events, spatial planning and their impact upon lesser metropolises, in the process of constructing a brand new image: a brief evaluation of the Athens 2004 Olympic Games. The case of Hellinikon Area as a lever of urban development,” in *47th Congress of the European Regional Science Association, Paris, 2007*.
- [10] S. Miles and R. Paddison, “Introduction: The rise and rise of culture-led urban regeneration,” *Urban Stud.*, vol. 42, no. 5–6, pp. 833–839, 2005.
- [11] F. J. Monclús, “Barcelona’s planning strategies: from ‘Paris of the South’ to the ‘Capital of West Mediterranean’,” *GeoJournal*, vol. 51, no. 1–2, pp. 57–63, 2000.
- [12] F.-J. Monclús, “The Barcelona model: and an original formula? From ‘reconstruction’ to strategic urban projects (1979–2004),” *Plan. Perspect.*, vol. 18, no. 4, pp. 399–421, 2003.
- [13] M. P. Balibrea, “Urbanism, culture and the post-industrial city: Challenging the ‘Barcelona model’,” *J. Span. Cult. Stud.*, vol. 2, no. 2, pp. 187–210, 2001.
- [14] R. J. Burdge and F. Vanclay, “Social impact assessment: a contribution to the state of the art series,” *Impact Assess.*, vol. 14, no. 1, pp. 59–86, 1996.
- [15] A. Bujari, M. Ciman, O. Gaggi, and C. E. Palazzi, “Using gamification to discover cultural heritage locations from geo-tagged photos,” *Pers. Ubiquitous Comput.*, vol. 21, no. 2, pp. 235–252, 2017.
- [16] S. Deterding, D. Dixon, R. Khaled, and L. Nacke, *Gamification: Toward a definition. CHI 2011, May 7-12, 2011, Vancouver, BC, Canada. ACM 978-1-4503-0268-5/11/05*. [Electron resource].—Режим доступу: <http://gamification-research.org/wpcontent/uploads/2011/04/02-Deterding-Khaled-Nacke-Dixon.pdf>, 2011.
- [17] D. Lockton, D. Harrison, and N. A. Stanton, *Design with intent: 101 patterns for influencing behaviour through design*. Dan Lockton, 2010.
- [18] C. S. King, K. M. Feltey, and B. O. Susel, “The question of participation: Toward authentic public participation in public administration,” *Public Adm. Rev.*, pp. 317–326, 1998.
- [19] R. D. Putnam, “Bowling alone: America’s declining social capital,” *J. Democr.*, vol. 6, no. 1, pp. 65–78, 1995.

- [20] S. R. Arnstein, "A ladder of citizen participation," *J. Am. Inst. Plann.*, vol. 35, no. 4, pp. 216–224, 1969.
- [21] R. A. Irvin and J. Stansbury, "Citizen participation in decision making: Is it worth the effort?," *Public Adm. Rev.*, vol. 64, no. 1, pp. 55–65, 2004.
- [22] A. Zubiaga, D. Spina, E. Amigó, and J. Gonzalo, "Towards real-time summarization of scheduled events from twitter streams," in *Proceedings of the 23rd ACM conference on Hypertext and social media*, 2012, pp. 319–320.
- [23] D. Buscaldi and I. Hernandez-Farias, "Sentiment analysis on microblogs for natural disasters management: a study on the 2014 genoa floodings," in *Proceedings of the 24th International Conference on World Wide Web*, 2015, pp. 1185–1188.
- [24] K. Rudra, S. Ghosh, N. Ganguly, P. Goyal, and S. Ghosh, "Extracting Situational Information from Microblogs during Disaster Events: a Classification-Summarization Approach," in *Proceedings of the 24th ACM International on Conference on Information and Knowledge Management*, 2015, pp. 583–592.
- [25] R. Wang, W. Huang, W. Chen, T. Wang, and K. Lei, "ASEM: Mining Aspects and Sentiment of Events from Microblog," in *Proceedings of the 24th ACM International on Conference on Information and Knowledge Management*, 2015, pp. 1923–1926.
- [26] C. Cottrill, G. Yeboah, P. Gault, J. D. Nelson, J. Anable, and T. Budd, "Tweeting transport: examining the use of twitter in transport events," in *Proceedings of the 47th Annual UTSG Conference*, 2015.
- [27] C. Caragea, A. Squicciarini, S. Stehle, K. Neppalli, and A. Tapia, "Mapping moods: geo-mapped sentiment analysis during hurricane Sandy," *Proc ISCRAM*, 2014.
- [28] Y. Lu, X. Hu, F. Wang, S. Kumar, H. Liu, and R. Maciejewski, "Visualizing social media sentiment in disaster scenarios," in *Proceedings of the 24th International Conference on World Wide Web*, 2015, pp. 1211–1215.
- [29] L. Anselin, "Spatial data analysis with GIS: an introduction to application in the social sciences," 1992.
- [30] M. G. Kendall and J. K. Ord, *Time-series*, vol. 296. Edward Arnold London, 1990.
- [31] J. Cohen, P. Cohen, S. G. West, and L. S. Aiken, *Applied multiple regression/correlation analysis for the behavioral sciences*. Routledge, 2013.
- [32] A. J. Bishara and J. B. Hittner, "Testing the significance of a correlation with nonnormal data: comparison of Pearson, Spearman, transformation, and resampling approaches," *Psychol. Methods*, vol. 17, no. 3, p. 399, 2012.
- [33] A. Field, *Discovering statistics using IBM SPSS statistics*. Sage, 2013.
- [34] J. D. Gibbons and S. Chakraborti, *Nonparametric statistical inference*. Springer, 2011.