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How Can Automated Text Analysis Enhance Local Digital Democracy?

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Abstract

Keywords:

Digital democracy, Local governance, Automated text analysis, Participatory democracy, Natural language processing

This article begins by defining digital democracy and tracing its development through two distinct waves. The first wave introduced digital tools for political discussions, while the second wave revolutionized digital democracy with advanced functionalities, increased binding nature, and mass participation. As the digital technologies have been integrated into society, digital democracy has played a pivotal role in transforming civic engagement and collective action. It has empowered individuals to shape their participation, fostering more responsive and inclusive decision-making processes. At the local level, digital democracy initiatives have emerged as powerful tools for citizen engagement and transparent governance. This article discusses the potential of automated text analysis in enhancing local democratic processes. It explores how these methods can improve citizen engagement, policy formation, and transparency at the grassroots level. By employing advanced natural language processing techniques, automated text analysis allows for the systematic examination of vast volumes of digital discourse such as social media conversations, online forums, and government documents. Through sentiment analysis, topic modeling, and clustering, these methods can contribute into how the sentiments, concerns, and priorities of local communities are shared and understood. Furthermore, these methods can also contribute to the development of more responsive and inclusive governance structures. By identifying emerging issues and public sentiment trends, policymakers can tailor their responses to address the evolving needs of their constituencies. This proactive approach fosters a deeper connection between local governments and their citizens, promoting greater trust and cooperation.

Otomatik Metin Analizi Yerel Dijital Demokrasiyi Nasıl Geliştirebilir?

Özet

Anahtar Kelimeler:

Dijital demokrasi, Yerel yönetim, Otomatik metin analizi, Katılımcı demokrasi, Doğal dil işleme

Bu makale, dijital demokrasiyi tanımlayarak başlamakta ve onun iki farklı dalga aracılığıyla gelişimini izlemektedir. İlk dalga, siyasi tartışmalar için dijital araçları tanıtırken, ikinci dalga gelişmiş işlevselliği, artan bağlayıcılığı ve kitle katılımı ile dijital demokrasiyi devrimleştirmektedir. Dijital teknolojiler topluma entegre olduğu sürece yerel demokrasi, sivil katılımı ve kolektif eylemi dönüştürmede önemli bir rol oynamaktadır. Bireylere katılımlarını şekillendirme gücü vererek daha duyarlı ve kapsayıcı karar alma süreçlerini oluşturmaktadır. Yerel düzeyde, dijital demokrasi girişimleri, vatandaş katılımı ve şeffaf yönetim için güçlü araçlar olarak ortaya çıkmaktadır. Bu makale, otomatik metin analizinin yerel demokratik süreçleri geliştirmekteki potansiyelini tartışmaktadır. Bu yöntemlerin vatandaş katılımını, politika oluşturmayı ve temel düzeyde şeffaflığı nasıl artırabileceğini incelemektedir. Gelişmiş doğal dil işleme tekniklerini kullanarak otomatik metin analiz yöntemleri; sosyal medya konuşmaları, online forumlar ve resmî belgeler gibi büyük hacimli metinleri sistemli bir şekilde incelemektedir. Bu yöntemler, yerel toplulukların duygusal tepkilerini, endişelerini ve önceliklerini nasıl paylaştığını ve anlamlandırdığını anlamamıza katkı sağlamaktadır. Ayrıca, bu yöntemler daha duyarlı ve kapsayıcı yönetim yapılarının geliştirilmesine de katkıda bulunmaktadır. Böylece, politika yapıcılar ortaya çıkan sorunları ve halkın duygusal eğilimlerini belirleyerek seçmenlerinin değişen ihtiyaçlarına cevap vermek için stratejilerini uygulayabilmektedirler. Bu proaktif yaklaşım, yerel yönetimler ile vatandaşlar arasında daha derin bir bağ kurulmasına yardımcı olmakta, güveni ve işbirliğini teşvik etmektedir.

INTRODUCTION

Political communication is an essential element of any democratic system due to serving as the central mechanism of the political system (Dahlgren, 2005). When we refer to the 'public', we generally mean open goods and spaces that are accessible to everyone. As there are more concrete public things like buildings, parks and squares, there are also more abstract public concepts such as public education and public opinion. These public goods are intended for the entire community, not for a small, privileged group. The public sphere acts as a space for political communication that mediates between society's other subsystems such as economy, culture, politics, and private life. As Habermas (1989: 52) stressed that the ideal public sphere encourages critical publicness and facilitates critical public debate within society. It serves as a platform where citizens meet, acquire information about society's life, and engage in political communication. The public sphere is where political opinions take shape (Habermas, 1989). In modern society, the media system plays a crucial role in organizing public communication (Fuchs, 2014). Media actors within this system generate public information. Although Habermas's concept of public sphere has faced criticism especially from postmodern perspectives, it remains relevant in the digital age and can be adapted to this context.

Digital public sphere cannot be considered as a separate space, instead it is a dimension of the public sphere (Fuchs, 2021). It involves the dissemination of information, critical promotion, and critical public discourse facilitated by digital communication technologies. In line with the increasing influence of digital technologies on online political engagement of citizens, the realm of digital democracy has gained prominence as one of the most vigorously examined areas within academic circles in recent years. The proliferation of publications addressing online political participation has shown a substantial uptick compared to the preceding decade (Rice & Fuller, 2013). Political participation, as defined by Verba, Schlozman, and Brady (1995), contains activities aimed at directly or indirectly influencing government actions or the outcomes of such endeavors. As well, online political participation involves activities that share the same objectives as traditional forms of civic engagement, such as voting or party membership. However, these activities also include seeking and consuming political information online, making financial contributions, sending email messages to government representatives or politicians, connecting with similar minded people in online communities and participating in protests, boycotts, and e-voting actions (Lutz, Hoffmann and Meckel, 2014). Utilizing online political participation platforms to boost citizen engagement in the policymaking process can be considered as a groundbreaking method because it helps elected officials ensure that their policies and programs accurately reflect the real needs of the society (Hull, West & Cecez-Kecmanovic, 2010). Research has shown that active participation in digital democracy by politicians and political entities can foster citizen trust, provided they exhibit accessibility, openness to discussion, and authenticity in their online presence, aligning it with their offline persona (Timonen, 2013). Nonetheless, it is essential to repeat that digital democracy does not simplify a politician's life or necessarily reinforce existing political structures. Instead, it establishes a direct connection between citizens and their representatives, inherently valuable in fostering engagement. These platforms empower citizens to exchange ideas and mobilize for political causes. Digital media offer a cost-effective means for political actors for disseminating their messages to a wider audience. It should also be noted that using digital democracy is a slowly evolving process to increase public engagement in policymaking. It needs a transformation in political culture to create transparent practices. In addition to that, along with traditional participation practices, digital democracy platforms can make civic involvement widespread (Freeman & Quirke, 2013).

At the local level, initiatives in digital democracy have emerged as mechanisms to promote transparency, accountability, and citizen empowerment, thereby reshaping the conventional relationship between residents and their governing bodies (Rouet & Côme, 2023: 109; Guallart, 2014). Citizens are empowered to enhance social justice and equality with the quality of decision-making processes locally. Digital democracy platforms can help governments become more transparent and accountable. Guillamón et al. (2016) show

that how Italian and Spanish municipalities use digital democracy platforms to share information. Factors such as the size of the population and income of citizens also affect how much these platforms are used. Interestingly, lower-income citizens seem to want more information through these platforms. However, governments in underdeveloped countries may be less willing to share information on these platforms to hide their problems. Their study also suggests that as more governments use digital democracy platforms, at the end, it will encourage governments to be more transparent because they promote interaction between citizens and governments.

This article aims to present the evolution of digital democracy at the local level and how automated text analysis methods can contribute to this transformation. It will start with the defining two waves of digital democracy, and then continue with its impact on civic engagement. Subsequently, it will present examples of digital democracy on local governance around the world. Following this, this article will provide some methods that can be used to improve the experiences of local democracy practices with respect to how the ideas are shared and understood. Lastly, this article will discuss the benefits and obstacles associated with its implementation at the local level.

THE WAVES OF DIGITAL DEMOCRACY

The rise of the Information and Communication Technologies (ICTs) has led to the use of digital technologies for democratic governance. The first instances of digital democracy go back to the proliferation of the Internet. The main aim of these instances were mainly to include more people into the political decision-making processes. In the literature, these practices have been called by different names such as "electronic democracy", "teledemocracy", and "cyber democracy" (Hague & Loader, 1999: 4, Hoggett, 1996). There are various understandings regarding the implementation of democratic practices using digital media outlets and tools. Despite this diversity, there is often a consensus when it comes to defining digital democracy (Dahlberg, 2011). Following the general approach in the literature, this study prefers the term 'digital democracy', which shows the potential of ICTs through advancements in digital data transmission, in bringing together existing electronic technologies. Digital democracy covers a broad spectrum of mechanisms and tools that utilize digital technology to make political participation, deliberation, and accountability easier (Chadwick, 2009). This definition can reflect the multifaceted nature of digital democracy by emphasizing its role in both enhancing citizen engagement and redefining the relationships between governments and their constituents.

The emergence of digital democracy has occurred in two distinct waves that each was marked by notable developments in the use of technology to enhance democratic processes. The first wave of digital democracy that goes back to the late 20th century, was based on the use of mass email campaigns and online forums. These early experiments created the foundation for the broader concept of electronic democracy. It was enough to show the potential of digital tools to engage citizens in political discussions and decision-making (Shulman, 2006; Andersen, Lee & Henriksen, 2020). On the other hand, in his seminal work, Gerbaudo (2019: 106-110) has distinguished between two different waves of digital democracy. The current second wave of digital democracy represents a significant evolution from its predecessor by introducing several noteworthy features. Firstly, it has witnessed a profound transformation in software functionalities. Unlike the early days when such tools were rudimentary, today's digital democracy platforms can incorporate advanced features that were non-existent previously. These new functionalities have revolutionized the process of decision-making and made it more accessible and inclusive for many people.

Secondly, the second wave of digital democracy is distinguished by the increased binding nature of its initiatives (Gerbaudo, 2019: 191). During the first wave, digital democracy efforts often operated as advisory mechanisms. Their functions were limited to provide recommendations to policymakers without any

guarantee of implementation. However, contemporary digital democracy initiatives can carry more weight, as they are increasingly designed to have a direct impact on policy decisions. This shift has elevated their political significance and reinforced their role in shaping the democratic landscape. The third and perhaps most remarkable feature of this second wave is the remarkable surge in mass participation. Beginning around the 2010s, digital democracy applications have succeeded in attracting unprecedented numbers of participants. These platforms can now boast participant counts that were unimaginable in earlier periods and even reach up to hundreds of thousands. This democratization of participation means that citizens are not merely passive observers but active contributors (Noveck & Cerf, 2020). They empowered to express their preferences and opinions directly. Consequently, this wave has transformed the traditional relationship between citizens and elected representatives, encouraging a shift from delegation to direct engagement in the democratic process.

DIGITALIZATION'S IMPACT ON CIVIC ENGAGEMENT

Digitalization is integrating digital technologies and communication systems into contemporary needs of society. This process has been transforming how the economy, culture, and social life function which has led to the emergence of a digitalized information society (Scott & Kreiss, 2016). While it enables organizing, backing up, and transferring data through a unified infrastructure, it has been reshaping power dynamics in political communication by overcoming spatial and temporal constraints (Korkut, 2022: 62). Digitalization has significantly changed political participation by altering the dynamics of civic engagement and collective action. Recently, individuals have more choice and agency in defining and shaping their civic participation, contrasting with the predigital era where participation was primarily influenced by organizations' incentives and opportunities (Bimber, Flanagin and Stohl, 2012). This shift has encouraged organizations to offer inclusive forms of engagement that allow individuals to share their ideas freely.

The use of digital trace data and analytics has played a crucial role in this transformation, providing immediate feedback on user actions and interactions. Civic organizations, such as MoveOn.org, utilize digital analytics to gauge interests and preferences of their users. That allows for more responsive and inclusive decision-making processes (Karpf, 2012). Moreover, digitalization has given rise to radically decentralized and networked forms of collective action. Scholars like Bennett and Segerberg (2013) highlight how digital media can create collective actions without a leader or a central government. The movements like El Movimiento 15-M in Spain and Occupy Wall Street in the United States are good examples for this transformation. These movements rely on personalized narratives and expressions that bridge the gap between public and private speech, shaping communication as the organizing principle itself. Consequently, mass movement can occur when there is no formal organizational structures to shape group action.

Enhancing Local Democracy Through Digitalization

In the context of digital democracy, there is ongoing debate regarding its practicality due to the limitations in enabling full citizen participation in governance. On the one hand, new technology would facilitate decentralized governance by shifting away from centralized policies and administration towards participatory democracy and local citizen management systems (Hoggett, 1996). On the other hand, as this transition has not yet fully materialized, prerequisites for successful applications for local citizen management systems would prevent the widespread implementation and hinder the realization of a truly participatory electronic democracy (Lim & Yigitcanlar, 2022). However, some local governments have successfully utilized Internet technologies to integrate citizens in political processes with effective electronic democracy platforms (Kars Tayanç & Çil, 2022: 24-25).

The emergence of the internet has created a virtual dimension of public space, including the operation of horizontal and non-centralized decision-making processes (Guallart, 2014). Despite the challenges faced by local governments in fully implementing such practices, efforts are being made to establish structures for electronic city communities and promote participatory democracy at the local level. For instance, in the 1992 U.S. presidential campaign, Ross Perot introduced the concept of "Electronic Town Meeting" (ETM) to enable direct citizen input into decision-making processes (Grosswiler, 1998). The term "Electronic Town Meeting" (ETM) has been used in various ways since its inception. It has been applied to public forums on TV and even phone voting by TV stations. Although this approach faced challenges in implementation, Perot gained 19% of the total vote in the presidential election and that was indicating public interest in such mechanisms. He talked about holding electronic town halls to gather public input on tax matters if he became president. He was essentially aiming to make it more of a public discussion or hearing. In between his 1992 and 1996 presidential campaigns, Perot tested this concept with TV presentation and a poll in a magazine. This approach was highly criticized for being biased and poorly produced and for being far from the original ETM idea (Becker, 2001). Despite failing to be applied correctly, it was important to continue innovative experiments, and demonstrate how ETMs can improve representative democratic processes and make them more citizen-friendly in the 21st century.

The evolution of digital democracy at the local level has been marked by several significant events and initiatives. In February 1989, The City of Santa Monica's early launch of its official city website marked one of the initial instances of local governments. The Public Electronic Network (PEN) of Santa Monica introduced the world's first municipal computer teleconferencing system (McKeown, 1991). Even though PEN was initially designed to connect residents with City Hall, it has quickly become an unexpected phenomenon as over six thousand residents signed up in a really short time of period. It is important to note that this was in a pre-social media era, PEN was a text-only with slow connection. Nonetheless, PEN democratized voices and included even the homeless resulting in initiatives like the homeless services center (Göker, 2007). PEN connected residents, activists, and officials, fostering discussions on local issues. However, the attacks from trolls eventually lead to its decline in the mid-90s. Despite its end, PEN remains a symbol of early online community engagement, highlighting both its potential and challenges in fostering civic discourse in the digital age. In 1994, the foundation of Minnesota E-Democracy set the stage for online citizen engagement in public policy discussions (Dahlberg, 2001). It was a non-profit organization aimed to enhance participatory democracy in Minnesota by utilizing information networks. Around the world, numerous innovative digital democracy initiatives at the local level have emerged as powerful tools for citizen engagement and transparent governance. Notable examples include:

- *Better Reykjavik:* Reykjavik, Iceland launched the Better Reykjavik platform in 2010. This pioneering initiative allows residents to propose and vote on ideas aimed at improving the city. It has been remarkably effective in empowering citizens to shape local policies and projects, contributing to Iceland's reputation for participatory democracy (Lackaff, 2016).

- *Decide Madrid:* In Madrid, Spain, Decide Madrid introduced in 2016 has transformed the landscape of local governance. This platform facilitates direct resident participation in political processes through online discussions and voting. Citizens can influence the allocation of municipal budgets and contribute to the development of policies, fostering a sense of ownership in the city's direction (Tseng, 2022).

- *Civic Engagement Commission:* New York City, USA, has embraced digital democracy with this platform that was introduced in 2019. This initiative connects residents with opportunities to volunteer and participate in local government initiatives, promoting civic engagement in the city's diverse communities (Fung, 2022).

- *Madame la Maire, J'ai une Idée!:* In Paris, France, it launched in 2014, allowing Parisians to have a direct say in local decision-making. This platform enables citizens to propose ideas and solutions directly to city officials, fostering collaboration and responsiveness in the city's administration (Certomà, Corsini & Frey, 2020).

INTEGRATING AUTOMATED TEXT ANALYSIS METHODS

Benefitting from automated text analysis methods serves for various purposes for local democracy practices. As the rapid growth of online communication platforms generates a huge volume of human-generated content, that offers a valuable source to understand public sentiments, concerns, and preferences. Integrating automated text analysis enables local governments to efficiently process and make sense of this vast information that would be impractical and sometimes impossible to analyze manually. With these analysis methods, local authorities can better prioritize issues, customize policies to answer specific concerns, and enhance community engagement (Cai, 2021). In addition to that, automated text analysis methods provide a data-driven approach to increase transparency and accountability by enabling decision-makers to base their actions on a more comprehensive understanding of public tendencies (Moats & Tseng, 2023). This integration allows for more informed, evidence-based decisions that can ultimately lead to more effective and responsive local democracy practices. At the end, the relationship between citizens and their government will be strengthened by integrating automated text analysis.

Public Sentiment Monitoring

Public sentiment analysis uses Natural Language Processing (NLP) techniques to determine the emotional tone of text data. It can be used to examine the sentiments of citizen for issues and projects. It can measure whether the public is generally supportive, neutral, or critical of these issues. Sentiment analysis usually involves the use of pre-trained models like BERT (Bidirectional Encoder Representations from Transformers) or GPT (Generative Pre-trained Transformer) to analyze text (Gao et al, 2019). It can use machine learning models like Support Vector Machines (SVM) and Recurrent Neural Networks (RNNs). They are trained on a labeled dataset of text with positive, negative, or neutral sentiments (Misnikov & Filatova, 2019). This method can be applied to the inputs of locals such as their comments, feedbacks, or their discussions on platform. For example, if there is a proposal to build a new park in a defined neighborhood, people can discuss their points, hesitations or expectations on the discussion board designated on the digital platform for this issue. Sentiment analysis of these comments can reveal that the general sentiment is either positive or negative. If the result is positive, that indicates that public sentiment is strongly backing for the initiative.

Issue Prioritization

This method can be used to prioritize issues based on public sentiment. To prioritize issues, sentiment analysis assigns a sentiment score to each piece of text inputs from citizens. It might assign a score of +1 for positive sentiment, -1 for negative sentiment, and 0 for neutral sentiment (Albanese, 2021). Sentiment analysis models can be fine-tuned specifically for local administration context. It can be trained with a labeled dataset of previously made comments on the digital platform that are tagged with sentiment labels. The model learns to recognize local sentiment patterns. At the end, it can enable to more accurately prioritize issues based on local sentiments. If sentiment analysis reveals that a particular policy proposal is generating overwhelmingly negative sentiment, it may indicate that the proposal needs further examination or adjustment before implementation. The municipality can then aggregate these scores to determine the overall sentiment of comments related to different issues. Issues with lower sentiment scores may indicate higher levels of concern (Zadra, 2020). For example, after a flood in that city, the municipality considers various flood mitigation measures. Sentiment analysis can show that the sentiment has turned negative over time

because of the mismanagement of the municipality. This signals that flood management is now a high-priority issue that demands immediate attention.

Performance Assessment

For longer periods of time, sentiment analysis can track changes in public sentiment toward the municipality's performance. This involves tracking sentiment scores on a rolling basis, calculating moving averages, and identifying trends and seasonality in sentiment data. This can be used to assess the effectiveness of projects and performance of local authority. It uses time-series analysis and regularly analyzes sentiment scores. Autoregressive integrated moving average (ARIMA) models and more advanced RNNs can be used for time-series analysis (Muhammad et al, 2021; Heidari, Navimipour & Unal, 2022). The local administration can detect trends in sentiment and assess whether public sentiment is improving or deteriorating over time. For example, if sentiment analysis consistently indicates that citizens are increasingly dissatisfied with the quality of public transportation services, this indicates that the municipality should conduct a thorough review of the transportation system and make necessary improvements.

Automatic Topic Identification

Topic modeling algorithms can automatically identify the main topics discussed on the digital platform. The most used algorithms are Latent Dirichlet Allocation (LDA) and Non-Negative Matrix Factorization (NMF) (Cai, 2021). The algorithms analyze the frequency and co-occurrence of words in the text data. They aim to find hidden topics that best explain the patterns in the text. For example, LDA assumes that each document is a combination of different topics, and each word is attributable to only one of those topics. It uncovers the underlying topic by iteratively adjusting these assignments in a way that maximizes the likelihood of the observed data. NMF factorizes the document-term matrix into non-negative components (Romberg & Escher, 2023). These components can be interpreted as topics and term distributions. It can reveal the topics discussed by citizens and group under categories such public safety, infrastructure, and transportation. This insight can help the municipality understand the multifaceted concerns of the community and allocate resources based on this data.

Content Organization

Right after the topics are identified, the text data can be categorized into these topics based on the probability of words belonging to each topic. Topic-document distributions can be calculated using probability distributions to assign each document a probability distribution over topics. The most probable topics for each document can be determined based on these distributions. This process can be implemented using linear algebra techniques. These techniques include singular value decomposition (SVD) and matrix factorization (Jha, 2020). This can allow the local administration to organize discussions and comments into relevant topic categories. When the discussions are categorized into topics, the result is a structured and easily navigable archive of information. This not only helps citizens find relevant information more efficiently but also helps local administrators in tracking the evolution of key topics over time (Moats & Tseng, 2023). For example, citizens interested in local education opportunities can quickly access all relevant discussions and updates related to this topic. This can help them stay informed and engaged in the decision-making process. At the same time, local administrators can use this structured archive to watch the public sentiment and identify areas that require further attention. At the end, this method can transparency and collaboration in local governance.

Clustering Similar Ideas

Clustering text data can used to group similar comments or ideas together. This is valuable for identifying main attitudes in public discussions and understanding the diversity of opinions on a particular topic. This methods can provide a consolidated view of citizen feedback. Clustering algorithms use mathematical optimization to minimize the variance within clusters. They calculate the distance between data points in a high-dimensional space and iteratively assign data points to clusters based on Euclidean distance or cosine similarity. The most used clustering techniques are K-Means and Hierarchical Clustering to analyze the similarity between different pieces of text (Sabo et al, 2022). These techniques measure the distance or similarity between comments based on words and longer phrases and group them into clusters accordingly. Comments with similar content or context are grouped together. For example, clustering can identify that several citizens are discussing traffic jam, while others are writing on safety of passengers. By grouping similar comments within these clusters, the local administration can gain a comprehensive view on transportation issues and can create an inclusive plan to address them.

Community Building

Topic modelling can also be used for user clustering based on their interaction with topics. The techniques like K-means clustering on user behavior data can track the frequency of engagement with specific topics or the similarity of topic interests (Sabo et al, 2022). Advanced clustering techniques like spectral clustering or density-based spatial clustering can be applied. They look at the density and connectivity of data points to allow for more accurate identification of community boundaries. This advanced user profiling can help customize content recommendations and engagement strategies. It can be used to identify niche areas of interest within the local community (Cai, 2021). For example, in the digital platform, a subgroup of users who share the same interests can be identified who frequently engage with specific topics or discussions. From that point, the local administration can suggest them to form a community and encourage local engagement by customizing projects to their specific concerns. A sense of community among like-minded individuals can be fostered with organizing some workshops and building a community house. Other than that, if a user frequently participates in discussions related to one specific issue, the platform can suggest relevant events, news articles, or discussions to that user to foster their involvement.

Table 1. Detailed summary of automated text analysis methods

Analysis Method	Description	Cases Used	Techniques	Data Sources
Public Sentiment Monitoring	Utilizes NLP techniques to determine emotional tone of text data.	- Examining public sentiments on issues and projects. - Analyzing comments, feedback, and discussions on a digital platform. - Assessing public support or opposition to initiatives.	NLP, Machine Learning	Citizen Comments, Feedback, Discussion Boards
Issue Prioritization	Assigns sentiment scores to text inputs to prioritize issues.	- Prioritizing issues based on public sentiment. - Identifying policy proposals that require further examination. - Aggregating scores to determine overall sentiment on different issues.	Sentiment Analysis Models	Citizen Comments, Feedback, Sentiment Labels
Performance Assessment	Tracks changes in public sentiment over time to assess performance.	- Evaluating effectiveness of projects and local administration. - Detecting trends and seasonality in sentiment data.	Time-Series Analysis, ARIMA, RNNs	Sentiment Scores Over Time

		- Recommending improvements based on sentiment analysis.		
Automatic Topic Identification	Automatically identifies main topics discussed on a digital platform.	- Understanding the diverse range of issues and concerns within the community. - Using algorithms like LDA and NMF to uncover hidden topics. - Grouping topics under relevant categories.	LDA, NMF, Topic Modeling	Text Data on Digital Platforms
Content Organization	Categorizes text data into topics to make it easily navigable.	- Organizing discussions and comments for efficient access. - Structuring and archiving vast amounts of text data. - Tracking the evolution of key topics over time.	SVD, Matrix Factorization	Categorized Text Data, Topic-Document Distributions
Clustering Similar Ideas	Groups similar comments or ideas together for a consolidated view.	- Identifying main attitudes in public discussions. - Understanding diversity of opinions on a topic. - Creating inclusive plans to address common issues.	K-Means, Hierarchical Clustering	Text Data, Clusters of Similar Ideas
Community Building	Uses topic modeling and user clustering to foster community engagement.	- Customizing content recommendations and engagement strategies. - Identifying niche areas of interest within the community. - Encouraging local engagement and sense of community.	User Clustering Algorithms, Spectral Clustering, Density-Based Clustering	User Behavior Data, Topic Interests

CONCLUSION

The concept of digital democracy, as explored in this article, offers significant implications and avenues for discussion in the context of modern political communication and governance. It presents a dual landscape of challenges and opportunities. On one hand, the democratization of participation through digital platforms can be hindered by issues such as the digital divide, where certain groups may have limited access to technology and the internet. Moreover, concerns about online privacy and security remain prominent, potentially deterring individuals from engaging in digital democracy. Balancing inclusivity and security are a complex challenge that policymakers and technologists must address. On the other hand, digital democracy opens doors to unprecedented opportunities for citizen engagement. It allows for the direct expression of preferences, opinions, and concerns, reducing the intermediation of traditional political structures. Moreover, digital platforms enable real-time feedback and data analysis, fostering responsive decision-making processes. The challenge lies in harnessing these opportunities while mitigating the associated risks. The question arises as to whether digital democracy complements or competes with representative democracy. Striking a balance between direct and representative forms of governance is a subject of ongoing debate. Additionally, the transparency and accountability facilitated by digital democracy platforms can reshape the relationship between citizens and governments. Governments are compelled to be more responsive to citizen

input, fostering a sense of ownership among the public. This change in dynamic can strengthen trust in institutions but may also necessitate adjustments in governance structures and practices.

The journey of digital democracy from its early days as a concept to its current form as a transformative force in local governance reveals a dynamic and evolving landscape of civic engagement. The concept of digital democracy, rooted in the idea of enhancing citizen participation through digital technologies, has evolved through two distinct waves. The first wave laid the groundwork by introducing digital tools for political discussions, while the second wave has ushered in a new era marked by advanced functionalities, increased binding nature, and mass participation. This second wave has redefined the relationship between citizens and their representatives, promoting direct engagement and democratizing participation. The use of digital trace data and analytics has allowed organizations to respond more effectively to citizens' preferences, fostering a more responsive and inclusive decision-making process. Moreover, digitalization has facilitated decentralized and networked forms of collective action, enabling leaderless and decentralized movements to emerge and shape the democratic landscape. At the local level, digital democracy initiatives have emerged as powerful tools for citizen engagement and transparent governance. Examples such as Better Reykjavik, Decide Madrid, Civic Engagement Commission in New York City, and Madame la Maire, J'ai une Idée! in Paris have demonstrated the potential of digital platforms to empower citizens, improve local policies, and foster a sense of ownership in their communities. While challenges and obstacles remain, the success stories of local digital democracy initiatives provide inspiration and guidance for future applications.

Integrating automated text analysis methods in local digital democracy practice holds great promise for different viewpoints. These methods offer a multifaceted approach to understanding and engaging with citizens. Public sentiment analysis can indicate which issues can be prioritized based on local's concerns. That enables more responsive decision-making for local authorities. Performance assessment over time allows for understanding reactions to government projects. Automatic topic identification and content organization help in structuring and accessing vast amounts of text data efficiently. Clustering similar ideas helps identify key attitudes in public discussions, and community building encourages engagement among like-minded individuals. Furthermore, it should be noted that online privacy and security concerns should be top priority to ensure inclusivity and trust in digital democracy platforms. In this area, we are witnessing the transformation of representative democracy and the new tools and opportunities for direct citizen participation. Transparency and accountability become crucial in this context because governments are increasingly expected to be responsive to citizen input. Local digital democracy practices present new opportunities for further research and development. If digital democracy platforms can be optimized through integrating automated text analysis methods, digital democracy at the local level can contribute to strengthen democratic societies for the future of democratic governance.

REFERENCES

Albanese, V. (2021). Sentiment and Visual Analysis: A Case Study of E-Participation to Give Value to Territorial Instances. *Representing Place and Territorial Identities in Europe: Discourses, Images, and Practices*, 67-79.

Andersen, K. N., Lee, J. and Henriksen, H. Z. (2020). Digital sclerosis? Wind of change for government and the employees. *Digital Government: Research and Practice*, 1(1), 1-14.

Becker, T. L. (2001). The comprehensive electronic town meeting and its role in 21st-century democracy. *Futures*, 33(3-4), 347-350.

Bennett, W. L. and Segerberg, A. (2013). *The logic of connective action: Digital media and the personalization of contentious politics*. Cambridge, UK: Cambridge University Press.

Brennen, J. S. and Kreiss, D. (2016). Digitalization. *The international encyclopedia of communication theory and philosophy*, UK: Wiley Blackwell, 1-11.

Cai, M. (2021). Natural language processing for urban research: A systematic review. *Heliyon*, 7(3), e06322.

Certomà, C., Corsini, F. and Frey, M. (2020). Hyperconnected, receptive and do-it-yourself city. An investigation into the European "imaginary" of crowdsourcing for urban governance. *Technology in Society*, 61, 101229.

Chadwick, A. (2008). Web 2.0: New challenges for the study of e-democracy in an era of informational exuberance. *Isjlp*, 5(1), 9-41.

Dahlberg, L. (2011). Re-constructing digital democracy: An outline of four 'positions.' *New media & society*, 13(6), 855-872.

Dahlberg, L. (2005). The Internet, public spheres, and political communication: Dispersion and deliberation. *Political Communication*, 22(2), 147-162.

Foster, D. (2013). Community and identity in the electronic village. *Internet Culture*. (Editor: D. Porter). Routledge, 23-37.

Freeman, J. and Quirke, S. (2013). Understanding e-democracy government-led initiatives for democratic reform. *JeDEM-eJournal of eDemocracy and Open Government*, 5(2), 141-154.

Fuchs, C. (2014). Social media and the public sphere. *tripleC: Communication, Capitalism & Critique*, 12(1), 57–101.

Fuchs, C. (2021). The Digital Commons and the Digital Public Sphere: How to Advance Digital Democracy Today. *Westminster Papers in Communication and Culture*, 16(1), 9-26.

Gao, Z., Feng, A., Song, X. and Wu, X. (2019). Target-dependent sentiment classification with BERT. *IEEE Access*, 7, 154290-154299.

Gerbaudo, P. (2019). *The Digital Party: Political Organisation and Online Democracy*. London: Pluto.

Göker, G. (2007). İnternet'in Türkiye Kadın Hareketi Üzerindeki Etkisi: Kadın Kurultayı E-Grubu Örneği. *Yeni Medya Çalışmaları*, 205-247.

Grosswiler, P. (1998). Historical hopes, media fears, and the electronic town meeting concept: where technology meets democracy or demagogy?. *Journal of Communication Inquiry*, 22(2), 133-151.

Guallart, V. (2014). *The Self-Sufficient City: Internet has changed our lives but it hasn't changed our cities, yet.* New York City: Actar.

Guillamón, M. D., Ríos, A. M., Gesuele, B. and Metallo, C. (2016). Factors influencing social media use in local governments: The case of Italy and Spain. *Government Information Quarterly*, 33(3), 460-471.

Habermas, J. (1989). *The Structural Transformation of the Public Sphere*. Cambridge, MA: MIT Press.

Hague, B. N. and Loader, B. (1999). *Digital democracy: Discourse and decision making in the information age*. New York: Psychology Press.

Heidari, A., Navimipour, N. J. and Unal, M. (2022). Applications of ML/DL in the management of smart cities and societies based on new trends in information technologies: A systematic literature review. *Sustainable Cities and Society*, 104089. DOI: 10.1016/j.scs.2022.104089

Hoggett, P. (1996). New modes of control in the public service. *Public Administration*, 74(1), 9-32.

Jha, R. (2020). Review of Data Mining and Data Warehousing Implementation in E-Governance. *International Journal of Innovative Science and Research Technology*, 5(10), 18-28.

Karpf, D. (2012). *The MoveOn effect: The unexpected transformation of American political advocacy*. New York, NY: Oxford University Press.

Korkut, Y. (2022). Siyasal Katılım ve Dijitalleşme. *Dijital Demokrasi*, (Editor: S. Çil). İstanbul: Eğitim Yayınevi, 55-69.

Lackaff, D. (2016). Case Study: Better Reykjavik—Open Municipal Policymaking. In *Civic media: Technology, Design, Practice,* (Editor: E. Gordon and P. Mihailidis), MIT Press, 229–234.

Lim, S. B. and Yigitcanlar, T. (2022). Participatory governance of Smart cities: Insights from e-participation of Putrajaya and Petaling Jaya, Malaysia. *Smart Cities*, 5(1), 71-89.

Lutz, C., Hoffmann, C. P. and Meckel, M. (2014). Beyond just politics: A systematic literature review of online participation. *First Monday*, 19(7), 1-36.

McKeown, K. (1991). Social Norms and Implications of Santa Monica's PEN (Public Electronic Network).

Misnikov, Y. and Filatova, O. (2019). Testing the applicability of training the Recurrent Neural Networks for analyzing online policy discourses in Russia. EGOV-CeDEM-ePart 2019, Proceedings of *Ongoing Research, Practitioners, Posters, Workshops, and Projects of the International Conference EGOVCeDEM-ePart 2019.* San Benedetto Del Tronto, Italy, 119-129.

Moats, D. and Tseng, Y. S. (2023). Sorting a public? Using quali-quantitative methods to interrogate the role of algorithms in digital democracy platforms. *Information, Communication & Society*, 1-35.

Muhammad, A. N., Aseere, A. M., Chiroma, H., Shah, H., Gital, A. Y. and Hashem, I. A. T. (2021). Deep learning application in smart cities: recent development, taxonomy, challenges and research prospects. *Neural Computing and Applications*, 33, 2973-3009.

Noveck, B. S. and Cerf, V. G. (2020). Digital Democracy: Past, Present, Future An Interview with Vinton G. Cerf Vice President and Chief Internet Evangelist, Google. *Digital Government: Research and Practice*, 1(1), 1-10.

Pina, V., Torres, L., Royo, S. and Garcia-Rayado, J. (2022). Decide Madrid: A Spanish best practice on e-participation, *Engaging Citizens in Policy Making* (Editor: T. Randma-Liiv, R. Nurske and V. Lember). London, UK: Edward Elgar Publishing, 152–165.

Romberg, J. and Escher, T. (2023). Making Sense of Citizens' Input through Artificial Intelligence: A Review of Methods for Computational Text Analysis to Support the Evaluation of Contributions in Public Participation. *Digital Government: Research and Practice*. DOI: 10.1145/3603254

Rouet, G. and Côme, T. (2023). *Participatory and Digital Democracy at the Local Level: European Discourses and Practices.* Springer Nature.

Sabo, I. C., Dal Pont, T. R., Wilton, P. E. V., Rover, A. J. and Hübner, J. F. (2022). Clustering of Brazilian legal judgments about failures in air transport service: an evaluation of different approaches. *Artificial Intelligence and Law*, 30(1), 21-57.

Shulman, S. (2006). Whither deliberation? Mass e-mail campaigns and U.S. regulatory rulemaking. *Journal of E-Government,* 3(3), 44-45.

Tayanç, N. K. and Çil, S. (2022). Demokrasi Arayışında İletişim Teknolojileri Ve Yönetim Modelleri. *Dijital Demokrasi*. (Editor: S. Çil). İstanbul: Eğitim Yayınevi, 7-30.

Timonen, A. (2013). Digital democracy in the EU. *European View*, 12(1), 103-112.

Tseng, Y. S. (2022). Rethinking gamified democracy as frictional: a comparative examination of the Decide Madrid and vTaiwan platforms. *Social & Cultural Geography*, 1-18.

Verba, S., Schlozman, K. L. and Brady, H. E. (1995). *Voice and equality: Civic voluntarism in American politics*, Cambridge, MA: Harvard University Press.

Zadra, M. (2020). Do Central Government e-Democracy Reforms Work for Mid-Size Municipalities? A Case Study of the Long-Term Effects of e-Petitioning in Southampton. In *14th ECPR General Conference*, 1-20.