Artvin Çoruh Üniversitesi
Orman Fakültesi Dergisi
ISSN:2146-1880, e-ISSN: 2146-698X
Yıl:2026, Cilt:27, Sayı:3, Sayfa:1-20

Artvin Çoruh University
Journal of Forestry Faculty
ISSN:2146-1880, e-ISSN: 2146-698X
Year:2026, Vol:27, Issue:3, Pages:1-20

ofd.artvin.edu.tr

Machine Learning-Based Sentiment Analysis for Foreign Visitors of Anıtkabir

Anıtkabir Yabancı Ziyaretçilerine Yönelik Makine Öğrenmesi Tabanlı Duygu Analizi

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Eser bilgisi/*Article info*
Araştırma makalesi/*Research article*
DOI: 10.17474/artvinofd.1918011
*Sorumlu yazar/*Corresponding author*
Şeyma YİĞİT UZUNALİ
e-mail: seymayigit@mku.edu.tr
Gönderilme tarihi/*Submission date*
28.03.2026
Kabul tarihi/*Acceptance date*
17.07.2026
Yayımlanma tarihi/*Publication date*
09.08.2026
Keywords:
Anıtkabir
Sentiment analysis
Machine learning
Foreign visitors
Parrott
Anahtar kelimeler:
Anıtkabir
Duygu analizi
Makine öğrenmesi
Yabancı ziyaretçiler
Parrott

Abstract
Sentiment analysis is a method used to understand user experiences, evaluate spatial perception, and make design processes more user oriented. Anıtkabir, a monumental complex integrating Turkish culture with national identity, evokes national and cultural emotions among domestic visitors while generating different meanings for foreign visitors. This study aims to reveal the emotions evoked by Anıtkabir's landscape and architectural features among foreign visitors between 2021 and 2025, using machine learning techniques. User comments shared on Google Maps were compiled to obtain meaningful data reflecting visitors' perceptions and evaluations. The dataset was analyzed according to Parrott's emotion classification framework and trained using Logistic Regression, Naive Bayes, Random Forest, and Support Vector Machine algorithms. Each model's performance metrics and predictive accuracy were assessed individually and comparatively. The results showed that the Logistic Regression model achieved the highest performance with an F1-score of 0.78. Findings indicate that Anıtkabir is positively perceived by foreign visitors, similarly to domestic visitors, highlighting that cultural heritage sites can generate meaningful emotional experiences across cultures. Overall, this study contributes to understanding how one of Türkiye's most significant cultural and national landmarks is experienced by international visitors, offering insights into the emotional dimensions of cross-cultural perception of heritage spaces. Furthermore, the study reveals the influence of landscape and spatial design components on visitors' emotional experiences in cultural heritage sites, thereby contributing to user-oriented landscape planning and design processes.

Öz
Duygu analizi, kullanıcı deneyimlerini anlamak, mekânsal algıyı değerlendirmek ve tasarım süreçlerini kullanıcı odaklı hale getirmek için kullanılan bir yöntemdir. Türk kültürünü ulusal kimlikle bütünleştiren anıtsal bir kompleks olan Anıtkabir, yerli ziyaretçilerde ulusal ve kültürel duygular uyandırırken, yabancı ziyaretçilerin zihninde farklı anlamlar ortaya çıkarmaktadır. Bu çalışma, 2021-2025 yılları arasında Anıtkabir'i ziyaret eden yabancı ziyaretçilerde mekânın peyzaj ve mimari özelliklerinin uyandırdığı duyguları makine öğrenmesi teknikleriyle ortaya koymayı amaçlamaktadır. Ziyaretçilerin algı ve değerlendirmelerini yansıtan Google Haritalar yorumları derlenerek anlamlı veriler elde edilmiştir. Veri seti, Parrott'un duygu sınıflandırma çerçevesine göre analiz edilmiş ve Lojistik Regresyon, Naive Bayes, Random Forest ve Destek Vektör Makineleri algoritmaları kullanılarak eğitilmiştir. Her bir modelin performans metrikleri ve tahmin doğruluğu ayrı ayrı ve karşılaştırmalı olarak değerlendirilmiştir. Sonuçlar, Lojistik Regresyon modelinin 0.78 F1-score değeriyle en yüksek performansı gösterdiğini ortaya koymuştur. Bulgular, Anıtkabir'in yabancı ziyaretçiler tarafından da tıpkı yerli ziyaretçiler gibi olumlu algılandığını ve kültürel miras alanlarının kültürler arası anlamlı duygusal deneyimler sunabildiğini göstermektedir. Genel olarak çalışma, Türkiye'nin en önemli kültürel ve ulusal simge mekânlarından biri olan Anıtkabir'in uluslararası ziyaretçiler tarafından nasıl algılandığını inceleyerek, kültürler arası mekân algısının duygusal boyutlarına ilişkin önemli çıkarımlar sunmaktadır. Ayrıca çalışma, kültürel miras alanlarında peyzaj ve mekânsal tasarım bileşenlerinin ziyaretçilerin duygusal deneyimleri üzerindeki etkisini ortaya koyarak, kullanıcı odaklı peyzaj planlama ve tasarım süreçlerine katkı sağlamaktadır.

INTRODUCTION

The development of civilisations is contingent on effective communication, which is one of the most significant factors in this process. Following the full launch of the internet in 1989, communication expanded significantly. The reasons for its success are threefold: the existence of job opportunities, the virtual accessibility of physical activities, and its cheap, easy and accessible nature. As a result, it has now become a leader in almost all sectors (Kleinrock, 2010; Cohen-Almagor, 2013). The advent of the internet has facilitated the virtualisation of social life, encompassing all emotions and thoughts, and the establishment of platforms on which information can be shared anonymously. The collection of anonymous or

conditional data has resulted in the development of methods for generating profit, and the establishment of the foundations for data mining based on personal information, preferences, desires and aspirations (Tsai et al., 2013; Chen et al., 2015). While the utilisation of personal data can be beneficial or detrimental across various commercial domains, its significance lies in its capacity to provide direct and impartial data for the analysis of human emotions.

In the context of the proliferation of social media networks, individuals have increasingly adopted the practice of publicly expressing their opinions, articulating grievances, and articulating their satisfaction with regard to various aspects of their geographical location, the services they receive, and a plethora of other issues. The internet has become a platform where users can conceal their identities, facilitating more candid and complete sharing of thoughts. In addition, certain platforms incorporate rating criteria and scoring options in conjunction with user comments. While this approach offers a straightforward method for approximating a user's sentiment towards a product, service, or establishment, it falls short in providing a comprehensive understanding of their emotional state. However, it is important to note that the desirability of a product, service or venue is directly linked to the feelings it evokes in users (Alameri et al., 2019; Ganesan, 2024).

Despite the intricacies inherent in the analysis of human emotions, user satisfaction can be analysed and classified according to emotions using an sentiment analysis based on machine learning. This classification facilitates the removal of negative attributes, enhancement, and optimisation of the product, object, or location that users comment on (Ku et al., 2009; Al-Ayyoub et al., 2019; Tokcaer, 2021; Liu et al., 2024; Ganesan, 2024; Yiğit Uzunali & Uzunali, 2025).

Sentiment analysis, text mining and natural language processing (NLP) (Sánchez et al., 2018) are all methods of evaluating people's attitudes, emotions and opinions based on text representations (Rahman et al., 2024). Machine learning algorithms are extensively utilised in sentiment analysis, particularly within the product and service sectors (Pang et al., 2002; Liu & Singh, 2004; Pang & Lee, 2008; O'keefe & Koprinska, 2009; Liu, 2010; Agarwal & Mittal, 2016).

The present study aims to analyse the emotional effects that Anıtkabir, one of the Republic of Türkiye's important memorial sites, evokes in foreign visitors using machine learning techniques. In order to contribute to the field of landscape architecture in the area of memorial site design, it is necessary to determine the emotional experience and thoughts that memorial sites of cultural significance, such as Anıtkabir, leave on foreign visitors who are not part of the memorial's culture. The symbolic elements employed in the landscape design of Anıtkabir serve to reinforce historical and national sentiments; iconic areas such as the Lion Road and the Ceremony Square are particularly effective in this regard, evoking a sense of respect and loyalty among visitors. In this context, the identification of the emotional responses associated with the global value of the memorial site will enable the acquisition of insights that will contribute to the development of cultural tourism on an international scale. Culturally significant sites such as these are perceived and experienced differently by local and foreign visitors. In this context, the examination of the impressions and feelings that foreign visitors gain about Turkish culture and the Republic of Türkiye through Anıtkabir, using advanced information technologies such as machine learning to analyse their free, independent, and spontaneous comments, increases the importance of this study.

The Relationship Between Landscape and Emotion at Anıtkabir

Anıtkabir is in the Çankaya district of Ankara. This area was formerly known as Anıttepe or Reşattepe. Anıtkabir contains monumental tombs and historical artefacts belonging to the Anatolian Phrygian civilisation. These artefacts date back to the 12th century BC. In the aftermath of the demise of Mustafa Kemal Atatürk, the founding leader of the Republic of Türkiye, this area was earmarked for the construction of Anıtkabir, with the objective of preserving his legacy. Following the conclusion of the archaeological excavations, the historical artefacts were transferred to the Museum of Anatolian Civilisations (Bilge & Küçükkaraca, 2022; Ministry of Culture and Tourism, 2024; Anıtkabir, 2025).

Construction of Anıtkabir commenced after the completion of the requisite expropriations, with the foundation stone being laid on 9 October 1944. The construction process, which endured for a period of nine years, was divided into four phases, with the project being executed across two sections: the Monument Block and Peace Park. The Monument Block is composed of the Lion Road, Ceremony Area and Mausoleum sections. The Peace Park, meanwhile, comprises approximately 48.500 trees of 104 different species, which have been brought from various regions of Türkiye and the world. Following the completion of the construction process on 1 September 1953, Anıtkabir was opened to the public on 10 November 1953, the 15th anniversary of the death of Mustafa Kemal Atatürk (Uysal & Selvi, 2012; Kuru, 2017; Bilge & Küçükkaraca, 2022).

Anıtkabir, the mausoleum and memorial complex that serves as a poignant testament to the legacy of Mustafa Kemal Atatürk, the founder of the Republic of Türkiye, occupies a distinguished place in the collective historical memory of Turkish society. Beyond its physical grandeur, characterised by meticulously designed landscape elements, the site offers a profound cultural and emotional experience. Anıtkabir's landscape design has been meticulously crafted to elicit a range of emotional responses in visitors, through the medium of its symbolic values and the strategic arrangement of the space. Anıtkabir is not only a symbolic space for the Republic of Türkiye, but also a monument that attracts the interest of international visitors and evokes different effects on individuals from different cultures. The perception of Anıtkabir by foreign visitors through the lens of their own cultural perspectives is a viewpoint that should be given due consideration when designing spaces that house cultural memory. For instance, while certain visitors may experience the space with profound respect and melancholy, others may encounter it as an awe-inspiring tourist attraction.

The emotional themes that are particularly salient in the landscape of Anıtkabir are also of significant importance from the perspective of landscape architecture. In areas such as Peace Park, which has been specifically designed to promote tranquillity and silence, the presence of greenery and natural elements has been shown to enhance visitors' sense of peace and well-being (Fekete & Abuhayya, 2023). The emphasis surrounding the mausoleum is pronounced. The presence of hard surfaces and monumental plants serves to emphasise the significance of the spatial environment. The Lion Road, which features lions an important symbol for the Turkish nation represents the 24 Oğuz tribes, while the lions in a reclining position symbolise peacefulness (Öztürk, 2019).

From the perspective of landscape architecture, it is considered that the spatial components within Anıtkabir trigger different emotional experiences. For instance, the dense vegetation texture, extensive green areas, and natural landscape elements employed within Peace Park may contribute to the emergence of positive emotions such as tranquillity, calmness, and happiness among visitors. In contrast, the use of hard surfaces surrounding the Mausoleum, the monumental scale, symmetrical spatial organisation, and strong axial orientation may intensify feelings of respect, admiration, awe, and emotional depth among visitors. Similarly, the repetitive rhythm, perspective effect, and symbolic sculptures along the Lion Road may lead visitors to perceive the space as more monumental and impressive. The vast sense of emptiness, symmetrical order, and monumental scale of the Ceremony Area may also contribute to visitors perceiving the space as formal, powerful, and historically influential. In this context, it is considered that the vegetative, structural, and symbolic elements employed in landscape design may be associated with the emotion categories identified in visitor comments. In particular, the emergence of emotions such as joy, surprise, love, or sadness/respect in relation to specific spatial experiences is important for evaluating the emotional impact of landscape design in cultural heritage sites. Within this framework, expressions such as “peaceful,” “impressive,” “respectful,” “magnificent,” “emotional,” and “surprising” appearing in visitor comments are associated with specific spatial experiences. This demonstrates that landscape architecture in cultural heritage areas is not merely a discipline that organises the physical environment, but also an important tool that shapes visitors’ spatial memory, identity, and emotional experience processes.

The landscape of Anıtkabir offers visitors an aesthetic as well as an emotional experience, thereby deepening the relationship between place and person. The results of the emotional analysis will facilitate a more profound comprehension of the feelings evoked by Anıtkabir in visitors from diverse cultural backgrounds, thereby unveiling the emotional experience associated with this landmark.

Tourism Statistics of Anıtkabir

Anıtkabir has been one of Türkiye's and Ankara's one of the major cultural and memorial attractions since its opening, thanks to its architectural and cultural features. The complex is visited by millions of people from diverse backgrounds throughout the year, particularly on special days such as 10 November and 29 October (Bilge & Küçükkaraca, 2022; Anıtkabir, 2025).

Anıtkabir's appeal to local and foreign visitors from different regions also translates into tourism potential within Ankara. Moreover, Anıtkabir's historical and cultural elements serve to underscore its status as a prime representative of the Republic of Türkiye and its cultural heritage. Anıtkabir offers visitors a multifaceted experience, providing a comprehensive overview of the history of the Republic of Türkiye, the life of Atatürk, the War of Independence, the modernisation process of the Republic of Türkiye, and elements of Turkish architecture and landscape. Anıtkabir, a significant landmark in the context of domestic tourism, offers foreign visitors and the international visitors a valuable opportunity to gain insight into Turkish culture and the Republic of Türkiye. The number of domestic and foreign tourists visiting Anıtkabir over the years is shown in Table 1 (Atakıshıyeva & Dinçer, 2022; Anıtkabir, 2025).

Table 1. Number of domestic and foreign visitors to Anıtkabir by year

Year	Local	Foreign
2025- Including October	5.668.725	308.324
2024	6.261.962	288.518
2023	5.744.544	286.136
2022	3.677.740	288.546
2021	2.084.991	91.982
2020	1.030.641	42.138
2019	6.038.387	364.597

As indicated in the Ministry of Culture and Tourism's 2023 Culture and Tourism Data report, which was published by the Ankara Provincial and Tourism Directorate, the number of foreign tourists who stayed in Ankara province increased from 451.974 in 2022 to 511.486 in 2023 (Ankara Governorship, 2024). When examining the number of foreign visitors to Anıtkabir together with the accommodation data presented in Table 1, the findings suggest that the number of foreign visitors to Anıtkabir corresponded to approximately 63% of the number of foreign tourists accommodated in Ankara in 2022 and approximately 56% in 2023. These statistics also indicate that Anıtkabir has a significant potential in terms of foreign visitors and tourism.

Sentiment Analysis

Text-based sentiment analysis and emotion recognition studies are generally grounded in discrete emotion theory, which suggests that human emotions can be categorised into a limited number of basic emotional classes (Bruna et al., 2016). In this context, emotional responses are influenced by psychological states, cultural background, environmental conditions, and individual experiences. Accordingly, numerous researchers have proposed different emotion classification models to categorise and interpret human emotions. Among the most widely used emotion classification models are

Ekman's basic emotion model, which is based on facial expressions, Plutchik's bipolar wheel of emotions, and Parrott's three-level hierarchical emotion model (Plutchik, 1984; Ekman, 1992; Parrott, 2001; Chafale & Pimpalkar, 2014; Butkute, 2023).

Machine Learning

Machine learning techniques are widely used for analysing and classifying various data types, including text, images, audio, and speech. In sentiment analysis and emotion classification studies, machine learning models analyse linguistic and semantic features extracted from textual data and learn patterns from labelled datasets through algorithm-based training processes (Kovahi & Provost, 1998; Hakak et al., 2017). This process enables the models to identify, analyse, and classify users' emotional expressions based on learned textual patterns. Machine learning-based classification processes generally rely on the use of training and test datasets. The training dataset consists of feature representations and their corresponding class labels. Using these labelled data, a classification model is developed to identify relationships between textual features and emotion classes. The developed model is subsequently evaluated on the test dataset and used to predict the class labels of previously unseen data (Neethu & Rajasree, 2013).

Machine learning algorithms are commonly categorised into three main learning approaches: supervised learning, unsupervised learning, and semi-supervised learning. Supervised learning refers to models trained using previously labelled datasets. In contrast, unsupervised learning involves identifying patterns and relationships within unlabelled data. Semi-supervised learning, on the other hand, combines both labelled and unlabelled data within the training process.

MATERIAL and METHOD

The present study employs machine learning techniques to analyse the emotional effects that Anıtkabir evokes in foreign visitors. In this context, the workflow consisting of the headings 'Determination of the study area', 'Creation of the Anıtkabir Data Set', 'Creation of the Emotion Data Set', 'Machine learning models' and 'Interpretation of findings' is presented in Figure 1.

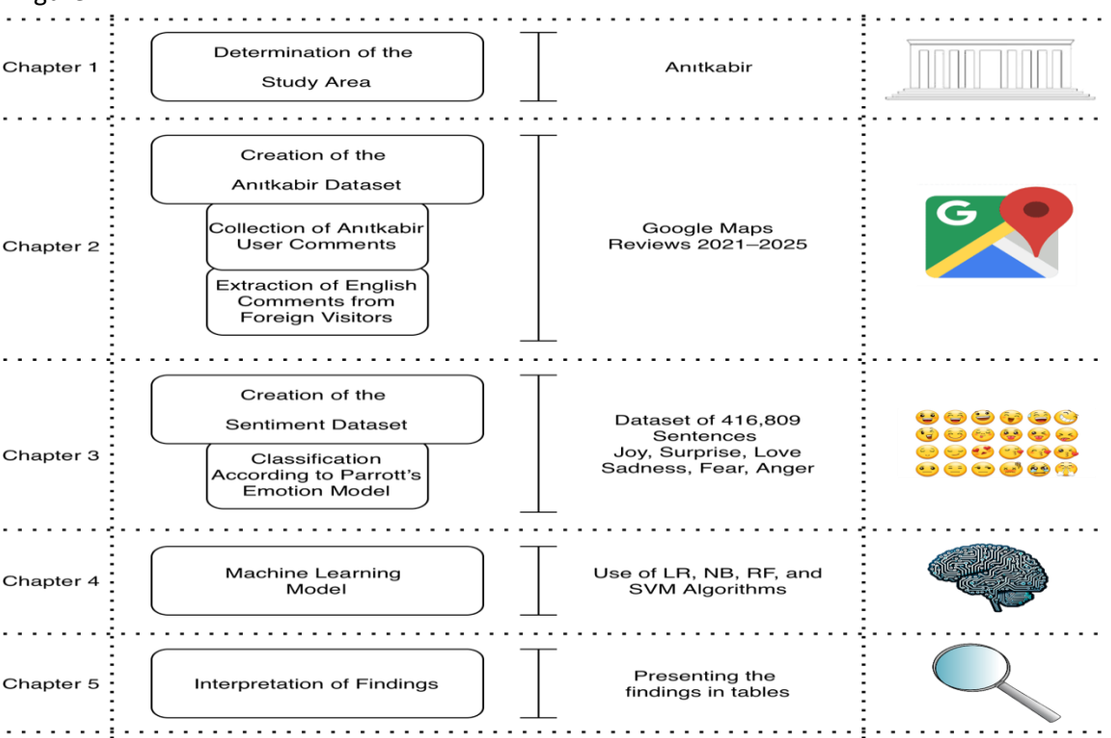

Figure 1. Workflow

Material

In the contemporary era, characterised by the pervasive utilisation of the internet, visitors increasingly employ online platforms to offer their evaluations of the places they visit. Google Maps, which is integrated with map usage, is at the forefront of these developments. The Anıtkabir site has received thousands of comments on this application. Most of these comments are written in Turkish; however, comments in different languages as well as various textual and symbolic contents are also present. Due to its widespread international use, English-language comments were preferred within the scope of the study. Therefore, English-language reviews related to Anıtkabir were collected using the "Outscraper" program.

In this study, data from 2021 onwards were specifically selected to examine the emotional expressions shared on digital platforms regarding Anıtkabir. The COVID-19 pandemic substantially altered social interaction patterns, visitor mobility, and digital communication behaviours. In the post-pandemic period, the use of social media and digital platforms increased considerably, enabling users to express their emotions and personal reflections more openly through online comments. Therefore, post-2021 data were preferred to better reflect post-pandemic visitor experiences and online emotional expressions related to Anıtkabir.

Within the scope of the study, a total of 44.980 user comments written between 2021 and 2025 were initially compiled and processed using Jupyter Notebook (JN), the Python 3.11 programming language version, and the Anaconda 3.9 distribution version. Since the study specifically aimed to examine the emotional perceptions of foreign visitors toward Anıtkabir, only English-language comments were included in the final dataset. Therefore, a multi-stage filtering process was applied. First, duplicate, incomplete, irrelevant, and non-textual entries were removed from the raw dataset. Second, comments that did not directly refer to Anıtkabir or did not contain sufficient textual content for sentiment analysis were excluded. Third, language detection was performed, and non-English comments were filtered out to focus on foreign visitors and ensure linguistic consistency in the machine learning-based emotion classification process. As a result of these filtering steps, the initial dataset of 44.980 comments was reduced to 754 English-language comments that met the inclusion criteria. Although the number of retained comments decreased substantially after the filtering process, the final dataset consisted of comments that directly matched the study objectives and provided linguistically consistent textual data for emotion classification. This filtered dataset was defined as the "Anıtkabir Dataset" and constituted the primary data source for the subsequent sentiment classification analyses.

Method

The analytical framework of the study consisted of the creation of the Emotion Dataset and the Anıtkabir Dataset, followed by their integration into machine learning-based analysis processes. In this study, an "Emotion Dataset" was initially constructed to classify six emotion categories derived from Parrott's emotion model, namely Joy, Love, Surprise, Anger, Sadness, and Fear. The dataset consisted of multiple publicly available English-language text datasets obtained from the Kaggle platform and comprised a total of 416.809 labelled text samples. The distribution of emotion classes included 141.067 Joy, 34.554 Love, 14.972 Surprise, 57.317 Anger, 121.187 Sadness, and 47.712 Fear texts (Figure 2).

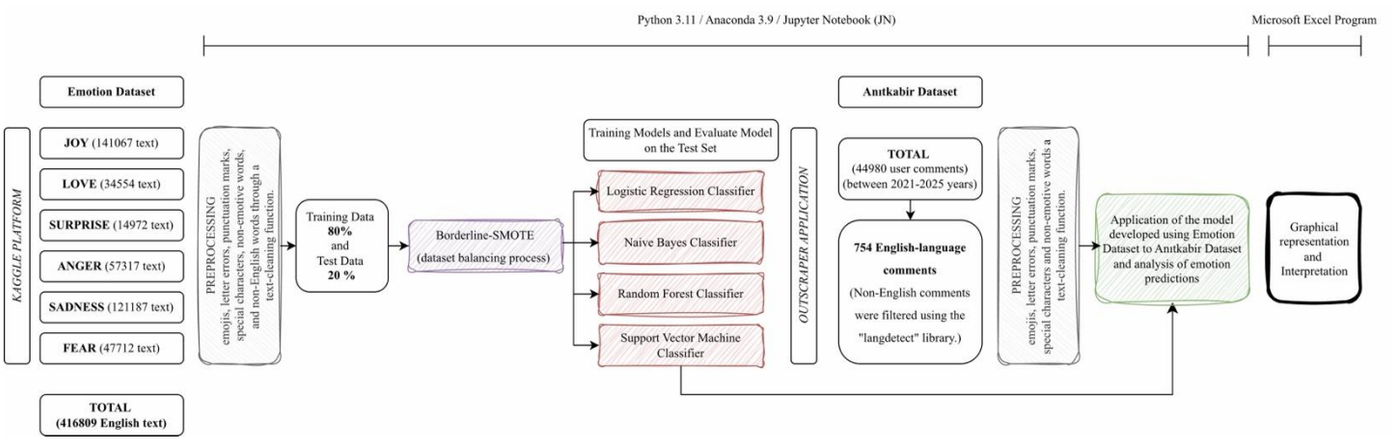

Figure 2. Analysis details of the method

Prior to the modelling process, the dataset underwent a comprehensive text preprocessing procedure. Within this process, emojis, punctuation marks, special characters, extra whitespace, and non-informative textual components were removed, and all text data were standardized into a consistent format (Table 2). Since the study focused exclusively on English-language emotion classification, non-English texts were filtered during preprocessing. Subsequently, the dataset was randomly divided into training (80%) and test (20%) subsets. Due to the unbalanced distribution of emotion classes, the Borderline-SMOTE (Synthetic Minority Over-Sampling Technique) method was applied to the training dataset to reduce class imbalance and establish a more balanced class distribution.

Following the preprocessing and balancing stages, four supervised machine learning algorithms—Logistic Regression (LR), Naive Bayes (NB), Random Forest (RF), and Support Vector Machine (SVM)—were trained and evaluated on the test dataset. After model evaluation, the trained models were applied to the "Anıtkabir Dataset, which consisted of 44.980 user comments collected between 2021 and 2025. To evaluate emotional expressions reflected in international English-language comments related to Anıtkabir, language detection was performed using the langdetect library, and non-English comments were excluded from the analysis. As a result of the filtering process, 754 English-language comments were retained for analysis. Although the number of retained comments decreased substantially after the filtering process, the final dataset consisted of comments that directly matched the study objectives and provided linguistically consistent textual data for emotion classification. The same preprocessing procedures applied to the Emotion Dataset were also applied to the Anıtkabir Dataset to ensure methodological consistency. Finally, the trained models were used to predict emotion categories within the Anıtkabir Dataset, and the obtained results were graphically represented and interpreted.

Table 2. Cleaning process of labeled emotion text data

Number	Text	Clean Text
0	I just feel helpless and heavy hearted	Feel helpless heavy hearted
1	Live enjoyed being able to slouch about relax a...	Able slouch relaxes unwind frankly end lately fi...
2	I gave up my internship with the dmrg and am f...	Gave internship feeling distraught
3	I don't know i feel so lost	Don't know feel lost
4	I am a kindergarten teacher and i am thoroughl...	Kindergarten teacher thoroughly weary job takes...
...	...	...
416805	I feel like telling these horny devils to find...	Feel like telling horny find site sort interes...
416806	I began to realize that when i was feeling agi...	Realize feeling restless thought
416807	I feel very curious be why previous early dawn...	Feel curious previous early dawn time seek tro...
416808	I feel that becuase of the tyranical nature of...	Feel nature government el savage social genera...

A language-based filtering approach was adopted in order to evaluate emotional perceptions reflected in international visitor experiences related to Anıtkabir. In this context, only comments identified as English-language texts were included in the analysis. However, since verifiable user information regarding nationality, country of residence, or visitor profile was not accessible within the scope of the study, it could not be definitively confirmed that all users writing comments in English were foreign visitors. Therefore, these comments were more cautiously interpreted as English-language comments with the potential to represent international visitor experiences.

Within the scope of the study, emotion classification was performed at the comment level rather than the word or sentence level. Accordingly, each user comment was evaluated textual unit, and the dominant emotion represented in the comment was assigned as a single emotion label. The machine learning models considered the semantic structure, contextual relationships, and overall emotional content of the complete text instead of analysing individual words independently. Therefore, comments containing multiple emotional expressions were classified according to the predominant emotional tendency identified within the overall context of the comment.

RESULTS

In the context of this study, four distinct algorithms (Logistic Regression, Naive Bayes, Random Forest, and Support Vector Machine) were employed. The findings of each algorithm were evaluated in two distinct ways: individually and collectively. In the Logistic Regression classification model, the 'random_state' parameter was set to 42 to ensure reproducible random splitting of the training and test datasets. The optimisation problem was solved using the 'liblinear' solver command. The accuracy rates of the logistic regression predictions, according to the specified parameters, are presented in Table 3.

Table 3. Logistic Regression Model Estimated accuracy values

LR	precision	recall	f1-sc	support
SADNESS	0.88	0.78	0.83	24201
JOY	0.92	0.80	0.86	28164
LOVE	0.67	0.82	0.73	6929
ANGER	0.68	0.78	0.73	11441
FEAR	0.75	0.72	0.73	9594
SURPRISE	0.31	0.66	0.42	3033
Accuracy			**0.78**	83362
Macro avg	0.70	0.76	0.72	83362
Weighted avg	0.81	0.79	0.79	83362

As illustrated in Table 3, the overall accuracy rate obtained in the emotion classification study conducted using the Logistic Regression algorithm was 78%. The macro averages (precision: 0.7, recall: 0.76, f1: 0.72) indicate that the model performed consistently well when all classes were considered.

An examination of the model's f1 scores revealed relatively high performance in the domains of joy (86%), sadness (83%), love (73%), anger (73%), and fear (73%). This finding suggests that the model can distinguish between emotions in a meaningful way. Although the surprise category (42%) exhibited comparatively lower performance, the model still demonstrated acceptable classification capability for this class. The Logistic Regression algorithm produced reliable results for the emotion classification task within the scope of this study.

The accuracy rates of the predictions made according to the parameters determined in the Naive Bayes algorithm model are given in Table 4. The overall accuracy rate obtained in the emotion classification study conducted with the Naive Bayes algorithm was 75%. This result is sufficient for a complex emotion classification problem. The macro average values (precision: 0.67, recall: 0.73, f1: 0.68) indicate that the model was able to make successful predictions in some classes.

Table 4. Naive Bayes Model Estimated accuracy values

NB	precision	recall	f1-sc	support
SADNESS	0.89	0.74	0.81	24201
JOY	0.88	0.78	0.83	28164
LOVE	0.56	0.78	0.65	6929
ANGER	0.72	0.74	0.73	11441
FEAR	0.68	0.72	0.70	9594
SURPRISE	0.28	0.62	0.38	3033
Accuracy			**0.75**	83362
Macro avg	0.67	0.73	0.68	83362
Weighted avg	0.79	0.75	0.76	83362

An examination of the model's f1 scores indicated relatively high performance in the categories of joy (83%), sadness (81%), anger (73%), fear (70%), and love (65%). Although the surprise category (38%) demonstrated comparatively lower performance, the model still produced acceptable results for this class. An analysis of the recall values indicates that they are distributed in a more meaningful and accurate manner. The Naive Bayes algorithm produced reliable results within the scope of the emotion classification process.

The Random Forest classification model was created using multiple parameters. The objective of the model was to minimise the number of predictors to optimise the prediction time. However, subsequent analyses revealed that reducing the number of predictors also decreased the accuracy rate. Therefore, the n_estimator's parameter was set to 100. The random_state parameter, which enables the random division of training and test data sets, was set to 42. In addition, the bootstrap parameter was set to 'false' in the sample selection method employed for the training of each tree. In accordance with these parameters, the accuracy rate of the Random Forest classifier obtained on the test data set is presented in Table 5.

Table 5. Random Forest Model estimated accuracy values

RF	precision	recall	f1-sc	support
SADNESS	0.81	0.81	0.81	24201
JOY	0.84	0.80	0.82	28164
LOVE	0.61	0.64	0.62	6929
ANGER	0.72	0.74	0.73	11441
FEAR	0.71	0.68	0.70	9594
SURPRISE	0.33	0.43	0.37	3033
Accuracy			**0.76**	83362
Macro avg	0.67	0.68	0.68	83362
Weighted avg	0.76	0.76	0.76	83362

In the emotion classification study conducted using the Random Forest algorithm, an overall accuracy rate of 76% was achieved. This outcome indicates that the model has accomplished a substantial degree of success in addressing a complex emotion classification problem. The macro averages (precision: 0.67, recall: 0.68, f1: 0.68) and weighted averages (precision: 0.76, recall: 0.76, f1: 0.76) demonstrate balanced performance across classes, thus indicating the model's overall effectiveness.

An examination of the model's f1 scores demonstrated relatively high performance in the categories of joy (82%), sadness (81%), anger (73%), fear (70%), and love (62%). Although the surprise category (37%) showed comparatively lower performance, the model still demonstrated acceptable classification capability for this class. An examination of the recall values reveals that they are distributed in a more meaningful manner. The Random Forest algorithm produced reliable and balanced results within the scope of the emotion classification problem addressed in this study.

In the Support Vector Machine classification model, a mathematical equation known as the 'kernel' was used to transform the data and create a hyperplane. In this instance, the kernel parameter in the model was set to 'linear'. The accuracy rate achieved on the test data set is presented in Table 6, within the framework of the specified parameters.

Table 6. Support vector machine model estimated accuracy values

SVM	precision	recall	f1-sc	support
SADNESS	0.87	0.77	0.82	24201
JOY	0.91	0.80	0.85	28164
LOVE	0.64	0.81	0.72	6929
ANGER	0.68	0.77	0.72	11441
FEAR	0.73	0.71	0.72	9594
SURPRISE	0.31	0.61	0.41	3033
Accuracy			**0.77**	83362
Macro avg	0.69	0.74	0.71	83362
Weighted avg	0.8	0.77	0.78	83362

The emotion classification study conducted using the Support Vector Machine algorithm yielded an overall accuracy rate of 77%. The macro average values (precision: 0.69, recall: 0.74, f1: 0.71) and weighted averages (precision: 0.8, recall: 0.77, f1: 0.78) indicate that the model performed consistently. The model demonstrated consistent performance across the joy (85%), sadness (82%), anger (72%), fear (72%), and love (72%) classes. Furthermore, the model demonstrated moderate performance in the surprise category with an f1-score of 41%. The Support Vector Machine (SVM) algorithm produced reliable results for the emotion classification task within the scope of this study.

In this study, emotion data derived from English-language Google Maps reviews related to Anıtkabir were analysed and these findings were evaluated in the context of tourism and landscape architecture. The results obtained from four different algorithms, normalised as percentages for emotion classes, are presented in Figure 3. These results are based on the data obtained within the scope of the study. The means of the emotions, calculated by taking the mean of the different algorithms, are presented in Figure 4.

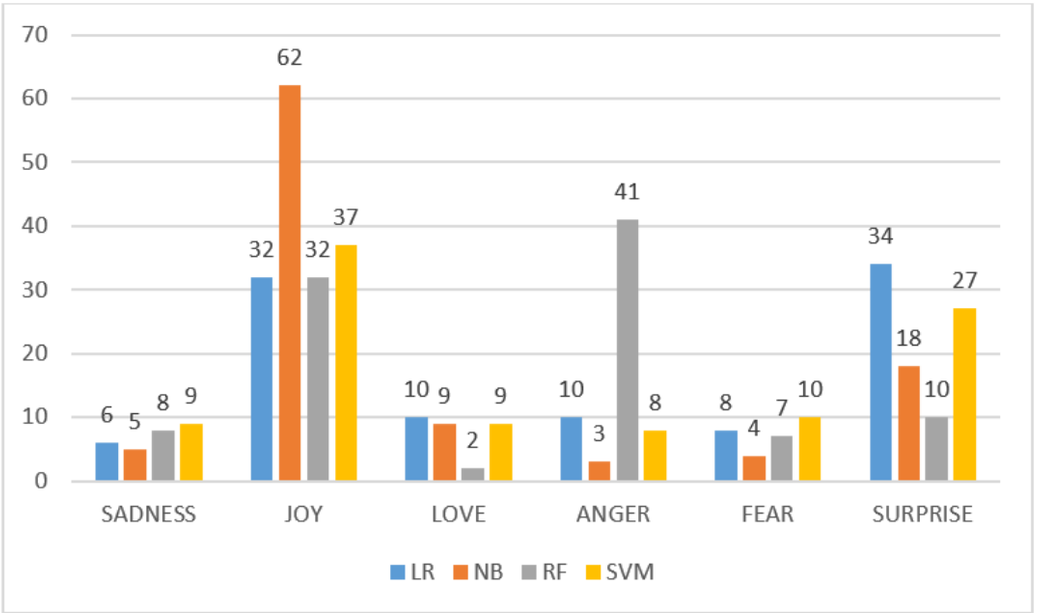

Figure 3. Sentiment class analysis of LR, NB, RF and SVM algorithms

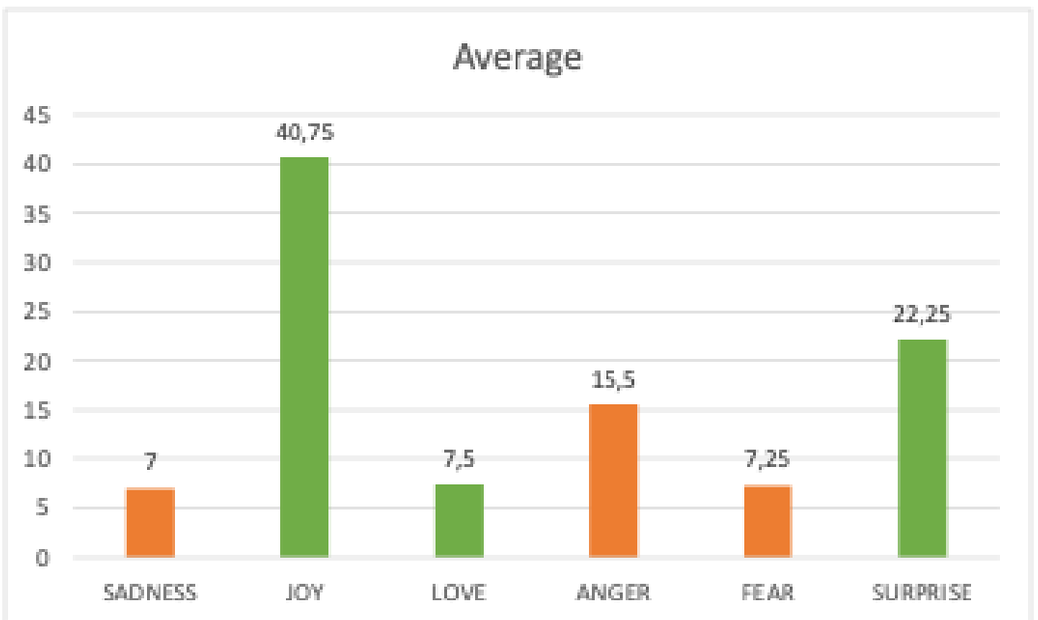

Figure 4. Average rates of emotion classes

The emotion percentages presented in the figure reflect the emotional responses associated with Anıtkabir's landscape and spatial experience. In this context, evaluating emotion categories independently provides a more comprehensive understanding of the relationship between spatial experience and emotional responses.

The most frequently observed emotion was identified as joy (40.75%). The findings suggest that the landscape design of Anıtkabir may contribute to positive emotional experiences associated with joy through the overall atmosphere of the space and its environmental arrangements. Anıtkabir's expansive open areas, its symmetrical design and its strategic

placement of sculptures may have contributed to the prominence of the emotion of joy by offering visitors a peaceful experience.

The mean level of surprise recorded was 22.25%, suggesting that the spatial and symbolic characteristics of Anıtkabir may generate unexpected emotional impressions among visitors. This finding indicates that the architectural structure, environmental setting, and symbolic meaning of the site may exceed visitors' prior expectations.

The presence of anger was identified in 15.5% of cases. This finding suggests that the architectural and landscape characteristics of Anıtkabir, together with its historical significance, evoke strong emotional responses associated with historical memory, symbolic meanings, and national identity among visitors. In addition, ideological and historical associations may also contribute to these emotional responses. These findings indicate that the site functions not only as a memorial space but also as a strong symbolic environment associated with collective memory and national identity. However, the emotional responses reflected in English-language visitor comments appeared to be moderate in intensity. The emotional responses identified in the comments further reinforce the symbolic significance of Anıtkabir at an international level.

The finding that the emotion category of love is approximately 7.5% suggests that the landscape and architecture of Anıtkabir, as a symbol of the Turkish nation's struggle for independence, may evoke feelings of affection and respect among visitors. The presence of affection indicates that visitors form an emotional connection with the place, perceiving Anıtkabir not merely as a monument but also as a historical heritage site.

The emotion category of fear (7.25%) may be associated with visitors' perceptions of the monumental and formal spatial character of Anıtkabir. In large-scale memorial environments, spatial hierarchy, monumental design, and formal architectural arrangements may contribute to feelings of seriousness, emotional intensity, or psychological distance among some visitors. However, since the present study relied solely on text-based emotion classification, these interpretations should be considered as potential spatial associations rather than definitive causal relationships.

When evaluating all parameters, it is evident that the landscape and architecture of Anıtkabir play a significant role in influencing the emotional responses of foreign visitors. The relatively high frequencies of emotions such as joy and surprise suggest that the landscape and architecture of Anıtkabir may contribute to meaningful and positive visitor experiences. Conversely, the lower frequencies of fear and sadness indicate that visitors generally perceive the site through positive and symbolically meaningful emotional responses. The findings demonstrate that the landscape of Anıtkabir is not merely a physical space but rather has the capacity to elicit a profound emotional response in visitors. As illustrated in Figure 5, the evaluation of data obtained from Google reviews of foreign visitors to Anıtkabir is categorised under positive and negative classifications. The graph created by taking the average of different algorithms is shown in Figure 6.

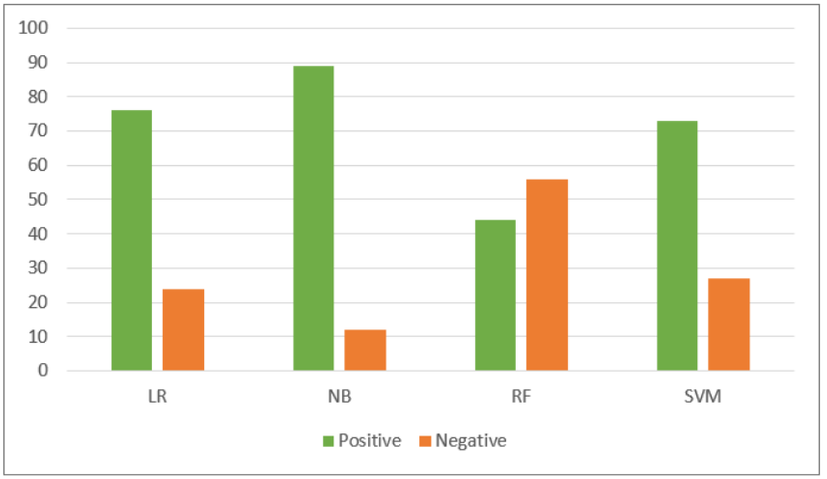

Figure 5. Sentiment analysis under positive and negative categories

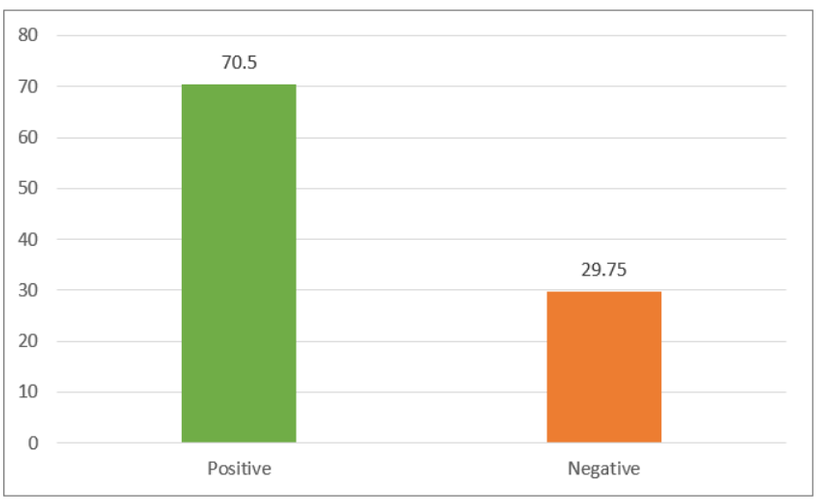

Figure 6. Average sentiment rates

The study revealed that positive emotion ratios were relatively high across many of the examined models. The models demonstrated an 89%, 76% and 73% prevalence in the Logistic Regression (LR), Naive Bayes (NB) and Support Vector Machine (SVM) models, respectively. However, a 44% discrepancy was observed in the Random Forest (RF) model. This variation in the RF model is related to the high incidence of anger. The mean positive sentiment of 70.5% indicates that foreign visitors generally harbour positive feelings towards Anıtkabir. The lower positive emotion ratio observed in the Random Forest model may be associated with the model's higher sensitivity to emotionally complex and context-dependent expressions. In particular, the RF model produced a higher proportion of anger classifications compared to the other algorithms, which may reflect its ability to capture emotionally intense expressions related to historical memory, nationalism, and symbolic meanings associated with Anıtkabir.

To better understand the relationship between spatial elements and emotional responses, reviews explicitly referring to physical landscape components of Anıtkabir were extracted and examined. Spatial elements such as the Perfbvace Park, Road of Lions, Ceremonial Ground, Ceremonial Plaza, gardens, landscaped grounds, and parks were identified through keyword-based screening of visitor reviews. The emotions assigned by the four machine learning models (RF, SVM, NB, and LR) were then compared for each review (Table 7).

Table 7. Emotions associated with spatial elements identified in visitor reviews of Anıtkabir

Comment	Spatial Component	RF	SVM	NB	LR	Majority
The complex consists of various structures and monuments, as well as a wooded area known as the Peace Park.	Peace Park	Fear	Love	Joy	Surprise	-
The Roads of Lion is beautiful.	Road of Lions	Surprise	Joy	Surprise	Joy	Joy Surprise
The Road of Lions, flanked by twelve pairs of monumental lion statues, symbolizes the strength and resilience of the Turkish people	Road of Lions	Surprise	Joy	Joy	Joy	Joy
His tomb faces the Atatürk Mausoleum, on the opposite side of the Ceremonial Ground.	Ceremonial Ground	Anger	Joy	Joy	Fear	Joy
The Ceremonial Plaza, with its vast open space and impressive symmetry, evokes a sense of grandeur and national unity.	Ceremonial Ground	Surprise	Joy	Joy	Joy	Joy
The surrounding park and ceremonial grounds are beautifully maintained, offering visitors a peaceful place to reflect.	Garden	Anger	Joy	Joy	Joy	Joy
This grand structure, surrounded by beautifully manicured gardens, creates a solemn and inspiring atmosphere.	Garden	Surprise	Joy	Joy	Joy	Joy
This majestic structure, surrounded by beautifully landscaped gardens, offers a solemn and awe-inspiring atmosphere.	Garden	Anger	Joy	Joy	Joy	Joy
The grandeur of the mausoleum, set amidst meticulously landscaped grounds, evokes a sense of reverence and respect.	Garden	Anger	Joy	Joy	Joy	Joy
The architecture is breathtaking, with vast courtyards, symbolic sculptures, and meticulously maintained gardens creating a serene atmosphere.	Garden	Fear	Joy	Joy	Fear	Joy Fear
The garden is beautiful.	Garden	Joy	Joy	Joy	Joy	Joy
Huge park dedicated to Turkish independance	Park	Anger	Surprise	Joy	Surprise	Surprise
The building is placed in the middle of an amazing park which is perfect for a walk.	Park	Surprise	Joy	Joy	Joy	Joy
Amazing greenery and many spots to sit relax and reflect.	Park	Surprise	Surprise	Joy	Surprise	Surprise

The results indicate that landscape-related spatial elements were predominantly associated with positive emotions. Gardens, landscaped grounds, parks, and ceremonial spaces were most frequently classified as joy by most models. In contrast, the Peace Park generated a wider range of emotional responses, including fear, love, joy, and surprise, suggesting a more complex emotional perception. The Road of Lions was primarily associated with joy and surprise, reflecting visitors' admiration of its symbolic and monumental character. Overall, the findings suggest that the spatial configuration and landscape features of Anıtkabir contribute substantially to positive visitor experiences.

When analysing the textual data used for emotion analysis significant meanings can also be derived from the most frequently used words. The most frequently used words identified in the English-language comments in their Google Maps reviews of Anıtkabir are visualised in Figure 7.

Figure 7. Anıtkabir Foreign visitor comments word cloud

When considering the word cloud, 'Atatürk' is one of the words most emphasised by foreign visitors. This outcome is unsurprising, given that Anıtkabir is a monument dedicated to Atatürk. However, from the perspective of foreign visitors, it reflects the recognisability and symbolic visibility of the site. The terms 'Visit, Türkiye, Turkish, Ankara' serve to underscore the significance of Anıtkabir as a prominent tourist destination within the context of the Republic of Türkiye and the city of Ankara. The exhibition 'History, Museum, Mausoleum' demonstrates that visitors have a comprehensive understanding of the historical and cultural context of the site. In the context of sentiment analysis, it is widely observed that the majority of words are associated with positive emotional tones. A close examination of the prominent sentiment words in the word cloud reveals the presence of positive words such as 'Beautiful, Amazing, Best, Worth'. The predominance of positive expressions within the word cloud suggests that visitors generally associate Anıtkabir with positive emotional and symbolic experiences. This finding further highlights the strong symbolic significance of Anıtkabir at both national and international levels.

DISCUSSIONS

Model Interpretation

The machine learning models employed in this study were selected to evaluate the emotional tendencies reflected in English-language Google Maps reviews related to Anıtkabir. The findings demonstrate that machine learning-based emotion analysis is an effective approach for examining the emotional dimensions of visitor experiences in cultural heritage sites. In particular, machine learning approaches are known to provide significant advantages in the analysis of large-scale textual data obtained from digital platforms (Rout et al., 2018; Umarani et al., 2021; Van Atteveldt et al., 2021; Wassan et al., 2021; Koukaras et al., 2022; Revathy et al., 2022; Rodrigues et al., 2022; Yiğit Uzunali & Uzunali, 2025).

In text-based machine learning studies, dataset size, class distribution, and data quality are among the major factors directly affecting model performance. While large datasets increase the learning capacity of models, imbalanced distributions among emotion classes may negatively affect classification performance (Kumar et al., 2021). Within the Emotion Dataset created for this study, the underrepresentation of certain emotion classes compared to others

constituted an important methodological challenge. To reduce the effects of this issue, the Borderline-SMOTE technique was applied to the training dataset. Thus, lower-represented emotion categories, particularly “surprise” and “love,” were learned in a more balanced manner during the training process (Werner de Vargas et al., 2023; Yiğit Uzunali & Uzunali, 2025).

Among the models used in this study, the Logistic Regression algorithm demonstrated the highest performance with an F1-score of 0.78. The model produced particularly successful results in the joy, sadness, anger, and fear categories. Similarly, the Support Vector Machine model generated balanced and relatively high accuracy rates. Although the Naive Bayes and Random Forest models exhibited comparatively lower performance, they still produced meaningful results in the identification of emotion categories. In particular, the lower performance observed across all models in the “surprise” category may be associated with the more context-dependent and semantically complex structure of this emotion class.

The Random Forest model provides advantages in processing complex data structures and reducing the risk of overfitting due to its ensemble structure consisting of multiple decision trees. Within the scope of this study, the model was employed to establish a stronger classification framework for the analysis of high-dimensional textual data. Similarly, the Support Vector Machine model produces successful results in text-based emotion classification by identifying the optimal hyperplane that maximizes class separation. The Logistic Regression model, on the other hand, yielded faster and more effective results through its linear probabilistic prediction mechanism. The advantageous characteristics of these models contributed to the successful classification performance achieved in this study.

In machine learning-based emotion analysis, textual data are processed by transforming them into numerical vector representations. Since textual data generally possess low-dimensional and sparse matrix structures, analysis processes can often be performed more efficiently. However, as dataset size increases, processing times may become longer, particularly in Random Forest and Support Vector Machine models. Within the scope of this study, the Logistic Regression model completed the analyses in a shorter time while simultaneously demonstrating the highest classification performance. This finding suggests that faster and computationally efficient models can be effectively utilised in emotion analysis studies conducted in cultural heritage sites.

The findings indicate that Anıtkabir is perceived by foreign visitors not only as a historical monument but also as a landscape setting capable of evoking strong emotional responses. The predominance of joy and surprise suggests that the spatial organisation, symbolic landscape elements, and monumental character of the site contribute positively to visitor experiences. In particular, the natural character of Peace Park, the expansive and symmetrical layout of the Ceremonial Plaza, the symbolic structure of the Road of Lions, and the monumental setting of the Mausoleum appear to influence visitor’s emotional perceptions.

These results demonstrate that landscape architectural elements within cultural heritage sites function beyond their aesthetic and physical roles, actively shaping emotional experiences and perceptions of place. The strong association between joy and spatial elements such as gardens, parks, and ceremonial spaces highlights the contribution of the designed landscape to visitor satisfaction and engagement. Consistent with previous studies emphasizing the role of landscape settings in fostering emotional attachment and place meaning, the findings suggest that the landscape of Anıtkabir serves as an important medium through which visitors experience admiration, reflection, and a sense of national identity.

Another important aspect of the study is that the Google Maps reviews contain user evaluations directly associated with physical spatial experiences. In sentiment and emotion analysis studies, datasets are generally obtained from Twitter, Facebook, blogs, or other social media platforms. In this study, however, the comments consisted of user evaluations

directly related to the Anıtkabir experience. This situation enabled the dataset to reflect spatial experiences and environmental perceptions associated with a specific cultural heritage site more directly. In this respect, the study demonstrates the applicability of machine learning-based emotion analysis in cultural heritage and landscape architecture research.

Limitations and Future Studies

One of the primary limitations of this study is associated with the inability to directly identify foreign visitors. Since access to user-specific information such as nationality, country of residence, or visitor profile was not possible, English-language comments were utilised as an indirect indicator representing international visitor experiences within the scope of the analysis. However, it cannot be definitively assumed that every user writing comments in English was a foreign visitor. Therefore, this limitation should be taken into consideration when interpreting the findings of the study. Future studies incorporating user profile information, geographical location data, or multilingual datasets may contribute to a more reliable evaluation of international visitor perceptions.

Another limitation is related to the dataset collection and filtering processes. From the large dataset obtained from Google Maps, only English-language comments meeting the specified criteria were included in the analysis. The removal of duplicate comments, incomplete entries, non-English texts, meaningless expressions, and emojis may have reduced the diversity of the dataset. Nevertheless, these preprocessing procedures were considered necessary to obtain more consistent emotion analysis results.

The imbalanced distribution of emotion classes within the Emotion Dataset also constitutes an important limitation of the study. Although the Borderline-SMOTE method was applied to reduce this imbalance, comparatively lower performance was still observed, particularly in the “surprise” category. This situation may be associated with the context-dependent nature of emotional expressions and the semantically more complex structure of certain emotion categories.

Another limitation of the study is the exclusive use of Parrott’s emotion model. Numerous emotion classification models based on different psychological and theoretical frameworks exist within the emotion analysis literature. In this study, Parrott’s emotion model was considered appropriate for representing the emotional expressions reflected in visitor comments. However, the use of alternative emotion models may produce different classification outcomes.

The findings of this study provide several recommendations for future research. First, future studies may employ multilingual datasets including comments written in different languages to evaluate international visitors’ spatial perceptions more comprehensively. Emotional variations according to visitors’ nationalities may also be investigated. In addition, interviews, questionnaires, and observational methods may be utilised to compare text-based emotion analysis results with direct user experiences. Furthermore, the relationships between specific spatial components such as the Lion Road, Peace Park, Ceremony Square, or the Mausoleum surroundings and different emotion categories may be examined separately. In this way, the relationship between landscape architectural elements and emotional perception in cultural heritage sites may be evaluated in greater detail.

In addition, future studies may compare the performance of different classification models using deep learning and advanced natural language processing techniques. Finally, considering the emotional and symbolic impacts of cultural heritage sites on visitors, it is recommended that interdisciplinary approaches integrating psychology, sociology, tourism, and spatial perception studies be further incorporated into planning and design studies within the field of landscape architecture.

CONCLUSION

Anıtkabir, a mausoleum constructed in honour of Mustafa Kemal Atatürk, the founder of the Republic of Türkiye, occupies a position of significant cultural and national importance within the Turkish context. This site is visited by millions of people every year, especially on special days, by national visitors, and is also an important tourist attraction for foreign visitors. The duration of time that foreign visitors spend at this location represents a valuable opportunity to introduce Turkish culture to the global community. This underscores the importance of analysing the experiences and emotions that foreign visitors encounter at this location.

The present study aims to examine the emotions revealed in the comments written by foreign visitors after experiencing the landscape and architectural elements of Anıtkabir. Utilising Parrott's emotion classes and a hybrid machine learning approach, it has been demonstrated that Anıtkabir offers not merely a physical spatial experience, but also provides meaningful emotional experiences for foreign visitors, despite cultural differences.

The results obtained from the sentiment analysis demonstrate that positive emotions were dominant within the visitor comments analysed in the study. In particular, the “joy” category emerged as the most prominent emotional response among foreign visitors, while emotions such as surprise and love were also identified at meaningful levels. These findings indicate that Anıtkabir is generally perceived by international visitors as an impressive, meaningful, and emotionally influential cultural heritage environment. In contrast, emotions such as fear and anger were identified at lower levels, suggesting that the site is predominantly associated with positive and respectful emotional experiences.

The landscape and architectural elements of Anıtkabir evoke feelings of national and universal significance due to their spatial hierarchy, simplicity and symbolic depth, thereby reinforcing the importance of the structure. In this context, the positive emotional experience of foreign visitors demonstrates that the national and cultural identity of the space is also influential, rather than being based solely on visual and aesthetic elements. The findings indicate that Anıtkabir holds significant importance not only for the citizens of the Republic of Türkiye but also for the global community. Despite its cultural and historical significance, the site has also been recognised for its potential to attract tourism and generate satisfaction among visitors from around the world.

Within the scope of the study, the Logistic Regression model achieved the highest classification performance among the machine learning algorithms employed, with an F1-score value of 0.78. The findings also demonstrated that machine learning-based sentiment analysis can be effectively utilised for evaluating emotional perceptions associated with cultural heritage spaces. In this respect, the study contributes both methodologically and conceptually to the fields of sentiment analysis, cultural heritage studies, and landscape architecture.

The word cloud generated from foreign visitor comments indicates that the dominant concepts associated with Anıtkabir are concentrated around themes of historical identity, cultural heritage, and national memory. Although word cloud analysis does not directly provide spatial behavioural data, it reveals the concepts and spatial representations that leave the strongest cognitive and emotional impressions on visitors. In this context, the prominence of terms such as “Atatürk,” “history,” “museum,” “mausoleum,” “Türkiye,” and “Ankara” demonstrates that foreign visitors perceive Anıtkabir not merely as a touristic destination, but also as a cultural heritage site carrying strong historical and symbolic meanings. Furthermore, the frequent occurrence of positive expressions such as “beautiful,” “amazing,” “best,” and “worth” suggests that visitors generally evaluate their overall experience of the site positively.

The study also indicates that the spatial organisation and symbolic landscape components of Anıtkabir may play an important role in shaping visitors' emotional perceptions. Spatial elements such as the Lion Road, Peace Park, Ceremony Area, and the monumental environment surrounding the Mausoleum may contribute to the emotional atmosphere experienced by visitors. From the perspective of landscape architecture, these findings demonstrate that cultural heritage spaces should be evaluated not only through their physical and visual characteristics but also through their emotional and experiential impacts on users.

Overall, the study demonstrates that Anıtkabir is perceived not only as a national memorial space but also as a cultural heritage landscape capable of generating meaningful emotional experiences among international visitors. In this respect, the findings provide an important basis for future interdisciplinary studies examining the relationship between landscape architecture, emotional perception, and cultural heritage experience.

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