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Prediction of Turkish Constitutional Court Decisions in Terms of Admissibility and Violation of Rights With Artificial Intelligence

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Abstract: The digitization of legal texts and advances in information processing theories and technologies have triggered several transformations in both the practice and teaching of law in recent years. Techniques developed in areas such as artificial intelligence, natural language processing, text mining, and machine learning have drawn the attention of legal practitioners and academics to this field. It is possible to remove obstacles to access to justice, improve legal security and certainty, and solve practical problems faced by legal practitioners by employing assistive tools to be created by using artificial intelligence technologies in the field of law. This study aims to develop an algorithm to predict the results of the Constitutional Court of the Republic of Turkiye on individual applications in terms of admissibility and whether there is a violation of rights by using machine learning and natural language processing techniques. In the study, the texts in the "Facts" title of the reference texts were used. A success rate of 91.56% was achieved for admissibility and 97.18% for whether there was a violation of rights. The study is unique in its field in that it performs a two-stage prediction task regarding admissibility and merit, provides a highly representative model since it includes all processable data, does not use a data augmentation method, and has a high success rate.

Yapay Zekâ ile Türk Anayasa Mahkemesi Kararlarının Kabul Edilebilirlik ve Hak İhlali Açısından Tahmini

Anahtar Kelimeler
Anayasa mahkemesi, Yapay zeka, Bireysel başvuru, Hak ihlali, Kabul edilebilirlik

Öz: Hukuk metinlerinin dijitalleştirilmesi ve bilgi işleme teorileri ve teknolojilerindeki ilerlemeler, son yıllarda hukukun hem uygulamasında hem de öğretiminde çeşitli dönüşümleri tetiklemiştir. Yapay zeka, doğal dil işleme, metin madenciliği ve makine öğrenmesi gibi alanlarda geliştirilen teknikler, hukuk uygulayıcılarının ve akademisyenlerin dikkatini bu alana çekmiştir. Hukuk alanında yapay zeka teknolojilerinin kullanılmasıyla oluşturulacak yardımcı araçların kullanılmasıyla adalete erişimin önündeki engellerin kaldırılması, hukuki güvenliğin ve kesinliğin artırılması ve hukuk uygulayıcılarının karşılaştığı pratik sorunların çözülmesi mümkündür. Bu çalışmada, makine öğrenmesi ve doğal dil işleme tekniklerini kullanarak Türkiye Cumhuriyeti Anayasa Mahkemesi'ne yapılan bireysel başvuruların usülen kabul edilebilirliğini ve hak ihlali olup olmadığını tahmin eden bir algoritma geliştirmeyi amaçlanmaktadır. Çalışmada, referans metinlerin "Olgular" başlığındaki metinler kullanılmıştır. Kabul edilebilirlik için %91,56, hak ihlali olup olmadığı için %97,18 başarı oranı elde edilmiştir. Çalışma, kabul edilebilirlik ve liyakat konusunda iki aşamalı bir tahmin görevi gerçekleştirmesi, tüm işlenebilir verileri içerdiğinden oldukça temsili bir model sunması, veri artırma yöntemi kullanmaması ve yüksek bir başarı oranına sahip olması bakımından kendi alanında benzersizdir.

1. INTRODUCTION

For centuries, legal experts have used doctrinal research methods to respond to the changing needs of society in the face of social, political, economic, and technological changes. This method includes describing laws, annotating legal regulations and judicial decisions, solving practical problems, and making systematic and theoretical inferences from all these studies. Doctrinal legal research is focused on providing a systematic interpretation of the norms prevailing in law, analyzing the relationships between the rules, explaining troubling issues, and predicting future developments [1-5]. However, in parallel with the pace of change in today's world, the law's ever-increasing and ever-changing scope of regulations, as well as the accumulation of precedent decisions that make it very difficult to be followed properly, make the work of legal practitioners very difficult. Developments, especially technological ones, which create this difficulty, also bring along opportunities to overcome these difficulties [6,7].

In contrast to doctrinal research methods, empirical or quantitative research techniques are rarely used in the field of law, especially when compared to the Anglo-American legal system. However, the ever-increasing caseload makes it impossible for legal researchers to read, analyze and systematize important international and national court decisions relevant to their field. Therefore, in these days of big data in law, it is argued that doctrinal and quantitative legal research can be combined to gain greater benefits from developing law, especially through case law [2, 8].

Although there are various quantitative research methods, studies using artificial intelligence are particularly in trend today. Since the day artificial intelligence came of age, artificial intelligence-based technologies have been used in various areas of life, from health to education, commerce to communication, and transportation to business management. In parallel with the development of artificial intelligence, in recent years, the digitization of legal texts and advances in information processing theory and technologies have triggered various transformations in both the practice and teaching of law. Techniques developed in areas such as artificial intelligence, natural language processing, text mining, and machine learning have attracted the attention of legal practitioners and academics. It is now seen that these techniques are actively used both in solving problems that arise during the practical application of law and in researching academic issues related to law and legal institutions [2][1].
It is important to note that it is impossible to automate all legal tasks regularly performed by legal practitioners, given the state of current Artificial Intelligence (AI) technologies. These tasks require very high intellectual skills and are well beyond the capacity of existing AI techniques. However, this does not mean that no legal work can be performed using artificial intelligence techniques. On the contrary, today's techniques allow a number of legal tasks to be completed by specially designed programs[2] [6, 9].

A wide range of legal tasks such as scanning and summarizing long and complex documents that law practitioners encounter in the conduct of litigation [10-13], classifying electronically stored documents in terms of their relevance to the dispute being litigated [3], determining the type of punishment to be applied by performing risk analysis in criminal cases [4] [14, 15], gathering and organizing information in court files [5], evaluating evidence and witness statements, identifying precedent decisions related to the subject matter of the case and pointing similarities[6], and making a decision on a legal dispute[7,8,9] [16], can be performed with very high success rates using artificial intelligence technologies.

At this point, it is worth mentioning machine learning, which is also very important for our work. Machine learning algorithms allow us to construct useful computer models of complex phenomena that can detect patterns in data and extract rules from them. It is also the case that

[1] The concept of judicial intelligence has been coined to describe the use of artificial intelligence in law. This concept describes a wide range of artificial intelligence applications to help solve legal problems, from predicting judgments to suggesting relevant legislation and identifying similar cases [31].

[2] The work of courts and judges is essentially information processing. The parties to a case submit some information to the court, the court process proceeds in a specific procedural manner, and in the end, the output is still information. Although this information processing process may seem quite complex, very few of the decisions rendered in the judicial process are related to complex disputes. In particular, most procedural disputes can be resolved with a simple assessment. A relatively large number of substantive disputes are repetitive disputes without any distinctive features, and their outcomes are predictable. Therefore, it is possible to use artificial intelligence at least as an auxiliary tool in the resolution of many legal disputes [15].

[3] In the US, this service offered by the "eDiscovery" application using artificial intelligence technology has achieved 76.7% success rate.

[4] In an application called COMPAS developed in the US, judges can use artificial intelligence technology, which enables risk analysis in criminal cases, to decide on the detention of the suspect or defendant or the type of punishment to be applied in case of conviction [14, 15].

[5] For example, in China, supporting artificial intelligence systems developed by Alibaba and iFLYTEK assist judges by using a technology-based speech recognition system called "Natural Language Processing" (NLP) and image processing technology. These systems are able to organize trial transcripts with a high degree of accuracy and extract important information from a wide range of evidence. With the help of these artificial intelligence-based systems, a saving of 30% to 50% of the time spent in trials has been achieved [16].

[6] For example, an application developed in China called "The 206 System" significantly assists judges in collecting, classifying, and verifying the accuracy of evidence; extracting important information from the evidence and eliminating irrelevant matters; and interpreting the evidence [16].

[7] In a pilot scheme launched in China in 2017 for the first time in history, AI-based robots preside over "smart courts" and rule on relatively small-scale disputes such as copyright issues and online shopping complaints [16].

[8] It has been stated that the outputs of artificial intelligence algorithms, which are trained by introducing a vast amount of existing judgments and legal rules, may be biased and therefore may lead to serious problems during their use in judicial processes. For more information on this issue, which is called the "black box" problem, see [14, 16].

[9] Upon the widespread use of AI-based technologies in judicial proceedings, the Council of Europe has specifically addressed the issue within the framework of Article 6 of the European Convention on Human Rights (the right to a fair trial) and established a set of ethical principles on what a reliable AI should look like, see https://op.europa.eu/en/publication-detail/-/publication/d3988569-0434-11ea-8c1f-01aa75ed71a1.

machine learning techniques can produce "intelligent" results by identifying proxies and patterns in data when performing complex and abstract tasks - albeit without being able to connect to the underlying conceptual content of the information. Therefore, some of the tasks performed manually by law practitioners can be performed semi-automatically by programs created using machine learning techniques, thereby achieving practical benefits [9, 17-20]. Moreover, researchers who have started to use machine learning techniques in the field of law use methods that minimize information loss and conduct more complex quantitative analyses with high-dimensional data than researchers who use traditional statistical methods such as regression analysis and work on lower-dimensional data by reducing the data to one or a few variables [2].

With the methods developed using machine learning algorithms, a data set containing legal issues that have been litigated and judged in the past can be created and the patterns in this data can be automatically detected and these patterns can then be used to predict future legal issues. One of these methods, closely related to our study, is supervised learning. In this method, the machine is expected to identify relationships between data that has been previously categorized by humans. Even if the constructed "predictive model" has only a few percentage points higher prediction success than a standard legal expert, it can be incorporated into legal advice services as an auxiliary tool [9, 21]. An inspiring and pioneering study was conducted in the United States. Throughout 2002, the US Supreme Court's decisions, which are considered by legal scholars to be very difficult to predict, were attempted to be predicted using two different methods. The first involved a statistical model that predicted outcomes based on six general case characteristics; the second involved a large group of legal experts, each making specific and independent predictions about one or more cases. In the end, the machine was significantly more successful than the legal experts. The experts correctly predicted 59.1% of court decisions, while the machine correctly predicted 75 [22]. On the other hand, the human mind has significant cognitive limitations[10] when it comes to processing and comprehending large amounts of data or paperwork. Even if one has access to all relevant information, in many cases, it is impossible to have a complete understanding of all aspects of the case or to process all data without the help of technology [17, 23]. While quantitative predictive models are not a solution to all of the potential cognitive limitations of the human mind, transparency in the development of predictive models can provide effective means of addressing some of these problems [6, 17].

Turning to the practical importance of quantitative predictive models and their development, it should first be noted that making informed and useful predictions of likely legal outcomes and liability is one of the fundamental qualities of being a lawyer. Lawyers are regularly expected to make predictions about quite different legal regulations [6, 9, 21, 24]. In the ordinary course of life, a client presents a lawyer with a legal problem consisting of complex facts and objectives. The lawyer, in the presence of legal and factual uncertainties, uses his or her judgment, experience, legal knowledge, education, and other cognitive abilities and intuitions to reasonably predict the likely outcome of the legal problem or who is legally responsible for it; then, based on these predictions and other factors, the lawyer draws a plan of action for the client with respect to the legal problem [6, 9][11].

The ability to assess overall legal outcomes and levels of liability risk in an environment of significant legal and factual uncertainty is one of the core functions of a good lawyer. However, increasingly, the assessment of these possible outcomes may be the subject of automated or semi-automated computer-based analysis. There is a significant amount of data available to enable this to be done, and machine learning techniques are rapidly acquiring the qualities to perform such a task. It is argued that the combination of human reasoning and machine learning algorithms will yield superior results compared to the use of the human mind alone in performing various legal prediction tasks [9, 17].

One of the various legal prediction tasks mentioned is the prediction of court judgments. Techniques in machine learning and natural language processing provide tools for automatically analyzing legal materials to build successful predictive models for predicting the outcomes of court decisions [25-27]. Using machine learning, it is possible to have a computer perform quantitative analyses based on the words, phrases, syntax, semantic and morphology used in court decisions and predict the court's decisions based on these analyses. If the results can be predicted accurately enough, it can then be determined which factors are influential in the formation of court decisions. In parallel with this situation, the study aims to provide a high-performance model that will provide support to users who want to make individual applications to the Constitutional Court and thus minimize possible loss of time and effort. However, it should be noted at this point that our aim in predicting court decisions is limited to the available data and the approaches we use. The aim of the present study is not to predict what the outcome would be if a victim who believes that his or her rights have been violated were to go to court - although of course this study and others like it aim to get closer to this broader goal [8]. On the other hand, as in all decision support models, the model presented in this study does not produce decisions, it only supports the decision maker. In this sense, it cannot be said that the results produced by the model have a legal binding.

[10] "Human reasoners have well-documented cognitive biases, such as the availability heuristic, optimism bias, anchoring, confirmation bias, illusion of validity, and the frequency illusion." [17]

[11] "Do I have a case? What is our likely exposure? How much is this going to cost? Are these documents relevant? What will happen if we leave this particular provision out of this contract? How can we best staff this particular legal matter? These are core questions asked by sophisticated clients such as general counsels as well as consumers at the retail level." [17]

Although there are different articles trying to predict constitutional court results with machine learning approaches, it is certain that it needs development at certain points. In his study, Sert [33] focused only on constitutional court decisions focused on "public morality and freedom of expression" and questioned their acceptability in terms of content. The author considered the "subject of the application" and "the evaluation" titles in the rapporteur draft text as the basic data set. These contents are partially formal in structure created by the rapporteur. Mumcuoğlu [7], while predicting decisions based on content, unlike Sert [33] model, used the "facts" heading containing the applicant's narrative, and the dataset was created with "data augmentation" methods. This study will present a machine learning model that works with balanced datasets that estimate decision acceptability in terms of form and content, taking into account the potential limitations in Sert [33] and Mumcuoğlu [7] studies, taking the "facts" heading in the rapporteur draft text as the basic data. The model will not work only focused on certain application types but will consider all individual constitutional court applications.

Before discussing the benefits of predicting court decisions using machine learning and natural language processing techniques, it is necessary to mention the function and importance of court decisions. First, it should be emphasized that court decisions play a critical role in resolving legal disputes, in legal education, and in future court decisions as a cyclical process. This is because some court decisions become precedents for the courts at the same level and lower levels. Prosecutors and judges follow and use these decisions to practice their profession in a way that is consistent with the legal system in which they practice. At the same time, lawyers analyze these decisions to predict the likelihood of winning in the cases their clients consult them on [28]. On the other hand, legal systems ensure legal certainty, which is a part of legal security, through court decisions. These decisions are of great importance both in terms of showing how abstract rules will be applied to concrete cases and in terms of demonstrating the legal consequences of individuals' behaviors in a more striking way [21].

Rapid developments in the social economy have complicated social relations and conflicts, which has significantly increased the workload on legal practitioners. On the other hand, the monopoly of the modern state over the judiciary has raised people's expectations of impartial and fair trials from the courts of modern states. Ensuring the balance between workload and fair trial has become an important problem of our time. Nowadays, legal data is a strategic resource and has significant economic value. Analyzing legal data using artificial intelligence can offer effective possibilities to alleviate the burden on legal practitioners and improve the quality and efficiency of adjudication [29, 30].

In this context, the benefits of predicting court decisions using artificial intelligence techniques are manifold and touch more than one point. First, we should start with the public benefits. For citizens who are not law practitioners but who wish to use judicial mechanisms and who have the poor legal knowledge, the use of AI for case analysis can ensure that the fair trial process is not affected by human factors and regional differences that have the potential to undermine it [31]. Automated decision prediction systems can play a role in delivering high-quality and cost-effective legal advice to people who do not work in the legal field and have difficulty understanding its terminology [32]. It can also be used to overcome the shortcomings of the legal aid institution, which is suffering from insufficient funds, imbalance of the supply structure, and low efficiency of the supply method. Thus, artificial intelligence can be used as a complementary tool that overcomes the limitations of the work experience of legal practitioners and provides relatively objective results [31].

Another important public benefit is legal security and certainty. Efforts to increase legal security and certainty for the orderly functioning of the social, political, economic, and cultural life of society constitute an integral part of human history. The publication of legal rules and court decisions are among these efforts. Leaving aside the question of whether it is important to predict judicial decisions from rule of law and procedural justice perspectives, analysis of legal texts using artificial intelligence techniques can enhance legal certainty [33]. Predicting court decisions is an important aspect of understanding the legal consequences of our behavior [21].

Just as important as legal security and certainty are the fundamental human rights to be tried within a reasonable time and to have access to the courts. Systems based on advanced decision prediction algorithms can be employed in courts as mechanisms to assist decision-making [34]. These systems can quickly identify cases and detect patterns that lead the decisions to turn out in a certain way. They can also be used to prioritize applications by identifying which applications are likely to involve violations of rights. This prioritization could increase the speed with which courts resolve applications where a violation of rights is more likely. This could encourage people who do not apply to the court due to long waiting times to do so when they believe their rights have been violated. This could contribute to promoting the right of access to a court [25, 33, 34].

In addition to the benefits above, AI-based applications, as auxiliary tools, can serve the public interest by saving time, reducing errors in practice, and increasing consistency [7]; help increase efficiency in judicial services [27] and promote legal equality and transparency [32]; facilitate the effective promotion of mediation activities [27]; contribute to reducing the workload on courts [39]; help lawyers assess their clients' claims in a timely and objective manner [6]; finally, contribute to reducing the workload on lawyers and help more clients receive legal advice more quickly, cheaply and efficiently, which can trigger positive transformations in the practice of the legal profession [6].

1.1. Related Works

As mentioned above, artificial intelligence is used to predict the outcomes of court decisions. In a very prescient article, Lawlor [40] stated that in the future, computers would be able to analyze judicial decisions and predict their outcomes [40]. Today, more than 50 years after his work, natural language processing and machine learning technologies offer the possibility to analyze legal texts and, through this analysis, to successfully predict court decisions [25].

Especially in recent years, a significant number of studies have been published on predicting the judgments of various national and international courts by using the aforementioned techniques. For example, in a study by Aletras et al. [25] on the judgments of the European Court of Human Rights (ECtHR), a Support Vector Machine classifier was used to predict whether Articles 3, 6 and 8 of the European Convention on Human Rights were violated or not (binary classification) based on 584 judgments, with a success rate of 79% [25]. In another study, which also focused on ECtHR judgments and followed a similar methodology, a more comprehensive (3,132 judgments) and balanced data set was used. Unlike the previous study, the "law" heading in the judgments, which includes the legal arguments of the court related to the relevant case, was not taught to the machine. As a result, a 77% success rate was achieved. The researchers stated that their study was more representative than the previous study because it used a larger data set and that the system was less "biased" because they did not teach the system the "law" heading in the judgments [8].

Studies on the prediction of judicial decisions are not limited to the ECtHR. For example, Katz et al. [17] used more than 28,000 decisions of the US Supreme Court and attempted to predict both the judgment as a whole and the votes of each judge. As a result, this study achieved 71.9% success in predicting the judges' vote and 70.2% success in predicting the court decision as a whole [17]. Lage-Freitas et al. [21] tried to predict the decisions of the Brazilian appellate court with a dataset of 4,403 decisions and achieved 79% success [21].

The highest success rate we have witnessed in the previous studies belongs to the study of Şulea et al. [46]. Taking more than 126,000 decisions of the French Supreme Court since the 1800s as a dataset, this study, unlike other studies, worked on two separate classification tasks with six and eight components, rather than two components, and achieved a success rate of up to 97% [46]. It is possible to say that the number and quality of the decisions in the data sets played a role in the high success of this study. In addition, the fact that the NLP method yields more successful results in inflected languages such as French than in agglutinative languages such as Turkish can be counted among the reasons for this result. On the other hand, Virtucio et al. [19], who studied the Philippine Supreme Court, obtained 59%, one of the lowest results in the previous studies, despite having a dataset of more than 27,000 decisions. The authors believe that this is due to the fact that the decisions in their dataset are structurally weaker than the decisions of the supreme courts in other countries, that the decisions are related to a wide variety of areas of law, and that there is no platform where they can obtain the decisions in a more organized manner [19].

It is necessary to mention two studies that are closely related to our study in terms of utilizing the decisions of the CCT as a data set. In a paper published in May 2021, a study was conducted on a total of 480 judgments on "public morality" (92 judgments) and "freedom of expression" (388 judgments) and tested whether the system created could successfully fulfill the two-component classification task (violation or no violation). The authors also included "inadmissible" judgments in the class of no violation of rights. It was stated that the experiment achieved an average success rate of 90% [33]. Another study published in July 2021 was not limited to the Constitutional Court, but also attempted to predict the decisions of many other high courts in Türkiye. In relation to the subject of our work, Mumcuoğlu et al. used a dataset of 1290 Constitutional Court decisions (149 no violations and 1141 violations) and achieved 91.8% success [7].

In addition to these studies, it has been attempted to make decision predictions based on the previous decisions of both higher courts and lower courts in areas such as criminal law, private law, family law, etc., and satisfactory results have been reached in a majority of the studies [26-29, 31, 32, 34].

1.2. Constitutional Court of The Republic of Turkiye

Constitutional Courts in the world came to the agenda after it was realized that the legislative power could make unconstitutional acts. As a result, constitutional courts in Europe were established independently from other judicial bodies, and thus, the model of constitutional jurisdiction based on a special court established for this purpose developed in Continental Europe, in addition to the example of constitutional jurisdiction in the USA. Although independent constitutional courts were first established in countries such as Austria, Czechoslovakia, Spain and Ireland following the First World War, with the spread of constitutionalism movements, especially after the Second World War the number of constitutional courts in the world increased rapidly and constitutional courts were established in countries such as Italy, Germany and France in Continental Europe [35]. The Republic of Türkiye was also included in the constitutionalism wave of this period and the "Constitutional Court of the Republic of Türkiye" (CCT) was established with the 1961 Constitution.

The main task of the constitutional courts is constitutionality review. In this context, constitutional courts review the constitutionality of laws and other legislative acts through abstract reviews and concrete control of norms. In addition to these duties, constitutional courts also protect constitutional values and fundamental rights and freedoms regulated in constitutions. Concordantly, a review mechanism called the individual

application procedure has also been developed to ensure the protection of individuals who believe that their constitutional rights and obligations have been violated by the public power. This mechanism is currently enshrined in the constitutions of Germany, Hungary, Portugal, Poland, the Czech Republic and Slovakia [36]. The first examples of the individual application procedure in the world were implemented in Latin countries before Europe [37]. In Türkiye, on the other hand, the individual application procedure is generally inspired by examples from continental Europe.

In the CCT, there was no such review mechanism prior to 2011. The 1921, 1924 and 1961 Constitutions and the first version of the 1982 Constitution did not regulate the individual application procedure. However, following the 2010 amendment to the Constitution, with the addition made to Article 148 of the 1982 Constitution of the Republic of Türkiye (CRT), the individual application procedure was added to the duties of the CCT. Following the constitutional amendment, the individual application procedure entered into force on September 23, 2012.

In Türkiye, the scope, proceeding, and consequences of the individual application procedure are regulated in Article 148 of the CRT and Law No. 6216. According to the CRT, anyone who believes that one of his/her fundamental rights and freedoms regulated in the Constitution and the European Convention on Human Rights (ECHR) has been violated by the public power may file an individual application to the CCT after exhausting the legal remedies. Other issues regarding the individual application procedure are regulated by Law No. 6216 on the Establishment and Trial Procedures of the Constitutional Court[12]. According to the relevant article of the CRT and the articles of the Law No. 6216 on individual application, anyone in Türkiye - real persons as well as private legal entities – whose one of the fundamental rights and freedoms enshrined in the CRT and the ECHR has been violated by public power can request the elimination of the consequences of this violation through an application to the CCT. However, the scope of the individual application procedure is limited both in terms of the subject matter of the application, the applicant and the period of time required for the application. With the individual application procedure, the Republic of Türkiye mainly aims to prevent the violation of the fundamental rights and freedoms of individuals protected by the CRT by public power, but it also aims to reduce the large number of applications against Türkiye to the European Court of Human Rights (ECtHR) and to create an effective judicial remedy to review these applications within the country before applying to the ECtHR [38]. Therefore, the scope of the individual application is limited to the fundamental rights and freedoms regulated in the ECHR among the fundamental rights and freedoms enshrined in the CRT.

Following an individual application, CCT conducts a two-stage examination. At the admissibility stage, it is evaluated whether the application fulfills the conditions stipulated in the law. At this stage, CCT examines the application in terms of person, place, time and subject matter, and decides; whether the ordinary remedies in domestic law are exhausted, an apparent violation in the application is existed and concrete evidence therein is included, the right of application is abused, the application has constitutional relevance/weight, and the damage caused by the violation of rights is significant [41]. This examination is carried out by the Commissions established within the Court and composed of two members of CCT, and a unanimous decision has to be taken as to whether the application meets the requirements. The Commission sends the applications that are deemed "admissible" to the Sections of the CCT, which are composed of a president and six CCT judges. The second stage of the examination of the applications, the examination on the merits, is carried out by the Sections. If the Sections are to render a decision that contradicts a previous decision or if they believe that the matter is important due to its nature, they may send the application to the Plenary Assembly, which is composed of all members of the CCT, and the Plenary Assembly shall decide on the application. If the Sections or the Plenary Assembly are of the opinion that a fundamental right and freedom has been violated, the relevant unit decides that the right has been violated, otherwise it decides that there has been no violation.

In reaching the above-mentioned decisions, CCT makes use of its rapporteur judges, as set out in Law No. 6216 and the Rules of Procedure of the Constitutional Court (Rules of Procedure)[13]. The rapporteurs prepare draft decisions on the relevant application and submit them to the Committees, Sections or the Plenary Assembly. The rapporteurs prepare these draft decisions in accordance with the format set out in the Rules of Procedure. In addition, the Research and Jurisprudence Unit established within the CCT examines the draft judgments in terms of consistency and development of case law, legal terminology, and spelling rules before they are discussed in the Plenary Session and the Sections. As a result, each decision of the CCT has a systematic style and literary structure in accordance with a certain format.

If there is an admissible application, the CCT first decides whether there is a violation of a right, and then, if there is a violation, whether there is a way to eliminate the consequences of this violation [42]. As a result, generally, the CCT awards pecuniary and/or non-pecuniary compensation for the damages caused by the violation of rights after the CCT renders a decision on the existence of a violation of rights. However, there is no limitation in the constitution or the law regarding the nature of the reparations that the CCT may rule. On the other hand, if the violation stems from a court decision - although it cannot retry the case itself - it sends the dispute that led to

[12] For the Turkish text of the law, see: https://www.resmigazete.gov.tr/eskiler/2011/04/20110403-1.htm, accessed on 29.03.2023.

[13] For the Turkish text of the law, see: https://www.resmigazete.gov.tr/eskiler/2012/07/20120712-18.htm, accessed on 29.03.2023.

the violation to the court that issued the decision for retrial; thus, it eliminates the consequences of the violation. Violation judgments are notified to the Ministry of Justice of the Republic of Türkiye together with those concerned and published on the Court's website. In addition, important judgments of the Court on individual applications are published in the Official Gazette. Thus, it is aimed that the legislative, executive, and judicial bodies are informed about the issues that cause violations of rights and develop policies to eliminate similar violations in future cases.

Since 2012, when it entered into force in Türkiye, the individual application procedure has had a significant impact on the protection of fundamental human rights, the reduction of human rights violations by the public power and the formulation of human rights-centered policies. At this point, individual applications have both direct effects by means of reparation of the harm of the person whose right is violated, and also have indirect effects [43]. When the CCT finds a violation in an individual application, if the violation stems from a law or an administrative regulatory act, it informs the relevant institutions about the normative regulation that led to the violation; if the violation stems from a judicial decision, it requests the court that issued the decision to conduct a retrial in accordance with the CCT 's violation decision. In the case of a violation of rights arising from a law or legislative act, the CCT also sends the violation decision to the Grand National Assembly of Türkiye ("GNAT") and draws the attention of it to the norm that caused the violation. Although this notification of the CCT is not a directive to the GNAT to amend or repeal the norm, it constitutes a contribution to the legislature towards the improvement of fundamental rights and freedoms and has a positive impact on the quality of the legislative function [44]. Thus, it increases the awareness of the administration, the legislature and the judiciary on fundamental rights and freedoms while fulfilling their duties. On the other hand, the CCT 's evaluations on fundamental rights and freedoms through individual application enables CCT to have a rights-centered approach in both abstract reviews and concrete control of norms [43].

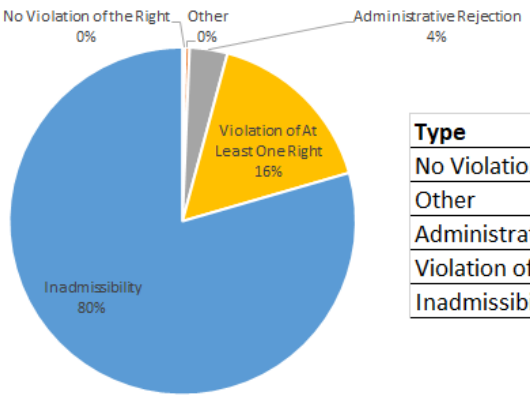
While the individual application procedure fulfills the above-mentioned functions in terms of the protection of fundamental rights and freedoms, it also encounters some problems. At this point, it is noteworthy that the number of individual applications to CCT is increasing day by day. On the other hand, the fact that the applications do not have the fundamental rights and freedoms-oriented perspective required by the individual application procedure, the fact that the applicants consider the individual application procedure as an appeal to the higher court as a continuation of the judicial process, and the lack of knowledge of both individuals and lawyers as to which cases involve a violation of fundamental rights and freedoms and whether this violation can be remedied through the individual application procedure increase the workload of the Court and thus make it difficult to conclude the applications within a reasonable time and reduce the efficiency of the individual application procedure [45]. The Individual Application Statistics published by the CCT every year clearly reflect this problem.

According to the CCT's Statistics on Individual Applications dated 2022, a total of 470,938 individual applications were made to the CCT between 2012 and 2022. 23.3% of these applications were made only in 2022. It is also observed that the CCT's workload has been on a general upward trend and has increased significantly, especially in the last two years [72]. Numbers according to years are given in Table 1. In parallel, the number of applications pending before the Court has been steadily increasing, from 17,046 to 72,278 in 2022 [72]. At this point, although it is seen that the CCT's workload has increased significantly, it is possible to draw inferences regarding the source of this increase when the statistics of the CCT's decisions rendered as a result of the applications are analyzed. According to 2022 data, CCT ruled inadmissibility in 298,059 of the 375,017 individual applications it has finalized to date. This number corresponds to 79.5% of the adjudicated applications [73].

Table 1. Number of Received and Adjudicated Individual Applications by Years

Year	Received	Ratio (%)	Adjudicated	Ratio (%)
2012	1342	0.28	4	0.00
2013	9897	2.10	4924	1.31
2014	20578	4.37	10926	2.91
2015	20376	4.33	15368	4.10
2016	80756	17.15	16089	4.29
2017	40530	8.61	89651	23.91
2018	38186	8.11	35357	9.43
2019	42971	9.12	39238	10.46
2020	40402	8.58	45197	12.05
2021	66121	14.04	45227	12.06
2022	109779	23.31	73036	19.48
Total	470938		375017	

Inadmissibility decisions are rendered in the case of individual applications that have not been filed in accordance with the procedure prescribed by the CCT and the law. In addition, the CCT may decide on the inadmissibility of applications that are not of importance for the application and interpretation of the CRT or for the determination of the scope and limits of fundamental rights and where the applicant has not suffered any significant damage, as well as applications that are manifestly ill-founded. In these cases, while seeking the existence of both elements together, the CCT may not decide on inadmissibility even in cases where it does not consider constitutional importance and at the same time considers that the applicant does not suffer significant damage [47] . In this instance, the Court has a margin of appreciation. The majority of the inadmissibility decisions are cases where the facts and circumstances of the violation of rights cannot be clearly concretized in the application, which is expressed as "manifestly ill-founded". Adjudicated applications by judgment type are below in Figure 1.



Type	Number	Ratio
No Violation of the Right	960	0,26
Other	1524	0,41
Administrative Rejection	13210	3,52
Violation of At Least One Ri	61264	16,34
Inadmissibility	298059	79,48

Figure 1. Adjudicated Applications by Judgment Type

These data on the individual application procedure show that both the applicants and the lawyers, who are the legal experts filing the applications, fail to correctly apply the format prescribed by the CCT in their applications[14], fail to correctly judge which events and facts show that fundamental rights and freedoms have been violated, thus causing the workload of the CCT to increase, reducing the efficiency of the individual application procedure and making it difficult for the CCT to finalize individual applications within a reasonable time. At this point, when annual statistics are analyzed, although the performance of the CCT can be considered satisfactory in terms of coping with the workload [48], looking at the 2021 and 2022 statistics, this performance of the CCT does not seem to be sustainable in the long term, given the increasing number of pending cases. These problems negatively affect the realization of the CCT's objectives of preventing violations of fundamental rights and freedoms by the public power and reducing the number of applications from Türkiye to the ECtHR. Failure to finalize the applications within reasonable periods of time will cause the CCT to be unable to fulfill its function as a "domestic law filter" in front of the applications to the ECtHR, and will also lead to the risk that the CCT will issue low quality decisions in order to meet the large number of applications while establishing the jurisprudence that will ensure the protection of fundamental rights and freedoms due to the increasing workload. Ultimately, the status of the individual application procedure as an effective remedy before the ECtHR will be jeopardized [38].

In order to make the workload of the CCT sustainable, it is necessary to reduce the number of individual applications and to improve the decision-making capacity of the CCT [49]. Problems similar to the above-mentioned problems of the CCT also exist at the ECtHR. Artificial intelligence-based systems are one of the means that the ECtHR is working on to cope with these workload problems. In the "Symposium on Workload in Individual Application and Solution Proposals" held by the CCT on March 1, 2022, to determine the strategies to deal with these problems, it was brought to the agenda whether artificial intelligence is planned to be used in handling this workload, along with many solution proposals put forward. CCT officials stated that studies are being carried out in this direction and that the issue is on the Court's agenda (*Bireysel Başvuruda İş Yükü ve Çözüm Önerileri Sempozyumu*, 2022, p. 77).

2. MATERIAL AND METHOD

The ability to analyze data in unstructured form can provide researchers with new perspectives, especially in the field of social sciences. In this sense, text mining methods are needed in order to process texts written in natural language properly. Text mining is an information-supported semi-automatic process that enables the extraction of implicit and useful information from unstructured data [50].

Most of the content that is the subject of text mining is texts produced in natural language. Natural Language Processing (NLP) is a set of special techniques based on Syntax (Syntax), linguistics (Morphology) and semantics (Semantics) that enable the analysis of such content [51]. Although NLP approaches provide significant benefits in many languages, the performance of the analyzes is affected due to the additive and rich formal language structure of Turkish [52]. In this study, it is aimed to establish a model that can predict the probability of acceptance of possible applications to the constitutional court, in terms of content and form, by processing the text mining methods of decision texts in semi-structured form produced in natural language. The process of the model to be constructed for this purpose is given in Figure 2.

[14] The CCT prescribes the format of individual applications with the help of a pre-prepared form that meets the requirements of the law and explains how to fill out the form in its guidelines (CCT, n.d.)

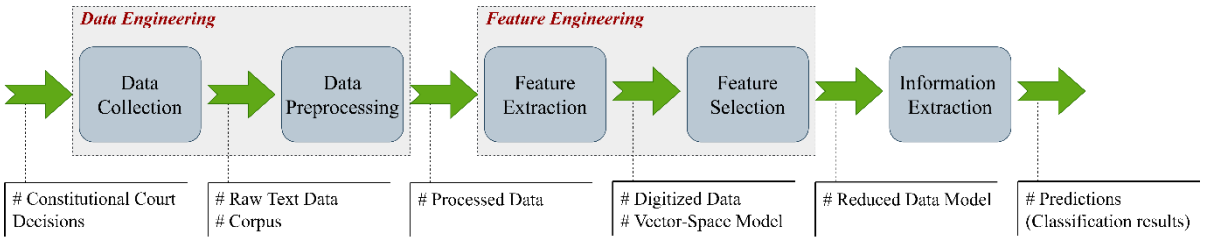


Figure 2. The process of the text mining approach in the study

Data engineering, with its most basic definition, is obtaining the data set and processing it to make it quality. Afterwards, the data set is digitized, and the necessary features are selected to make it ready for analysis from the feature engineering stage. In the last stage, information extraction is carried out with the estimation (classification) model.

2.1. Data Collection

Similar to other mining processes, the first step in text mining applications is to obtain data. The main data source is generally open access in the web environment and data is extracted with special techniques called scraping. The main output of the data collection phase is a collection of documents called corpus.

2.2. Data Preprocessing

The performance of analysis processes in text mining is directly related to the quality of the corpus. If the data set in the corpus is not properly formatted, in other words, if the data quality is not obtained, a situation known as the "Garbage-in, Garbage-out" phenomenon may be encountered. In this sense, data preprocessing steps are critical [53, 54].

The first step in the preprocessing processes is tokenazing, in which texts are broken down into their smallest units. During this process, each word, punctuation mark, symbol, etc. is converted into tokens. Optionally, the unit list can be extended by creating word groups with n-gram techniques [55, 56]. The second stage is the standardization of the list of tokens. For this purpose, numbers, punctuation marks, symbols, abbreviations, white spaces are removed first. Capital letters are converted to lowercase letters. Thus, a list of only lowercase words is obtained [56]. With the standardized list filtering stage, it takes its final form before linguistic preprocessing. During the filtering step, stop words are removed [55, 56]. For this process, the Turkish stop word list consisting of 179 words in the NLTK library in Python was used. In addition, words lower than a certain frequency should be removed and the matrix size should be reduced to a controllable level. In the last stage, words are cleaned from their suffixes and reduced to their roots. In addition, the function of these words in the sentence, the types of words and phrases are also performed at this stage with the sentence part-of-speech tagging method [56-59]. At the end of this stage, different attributes are added to each word and phrase.

After the data preprocessing stage, the data set, which has been processed and improved in quality, is transferred to the feature engineering process with the term document matrix structure.

2.3. Feature Extraction

The term document matrix obtained as a result of the preprocessing process must be digitized with a special transformation called vector-space model before the information extraction step. This process actually consists of rearranging the texts with some numerical conversion functions. At this stage, which is called feature extraction, there are different levels of vector space models.

Term Frequency – Inverse Document Frequency (TF-IDF) method, which performs numerical conversion at character and word level, is one of the most preferred methods [55]. TF-IDF calculates a value depending on the proportional frequency of the number of a word in the document and in the total corpus, together with the calculated value, how much information that word carries, or how important the world, is determined.

The Word2Vec method, which transforms at the word level, is the word embedding technique that has been preferred in academic studies in recent years with its high performance. The method, which is a prediction-based unsupervised learning approach, was invented in 2013 [60]. In matrix-based transformation, digitization according to the difference in operation of inputs and outputs is performed by Continous Bag of Words (cBOW) and SkipGram methods [61].

While the importance of the word in the document is taken into account in the TF-IDF method, it is independent of the semantic relationship [63]. In the Word2Vec method, the semantic relationship is provided to a certain extent by the window_size parameter [62]. The Doc2Vec method, which is a Document-Level embedding technique, is a special artificial neural network-based method that transforms the document as a whole into a numerical matrix, taking into account the semantic relationship. The difference of the method, which works with the Distributed Memory Model Of Paragraph Vectors (PV-DM) and Paragraph Vector With A Distributed Bag Of Words (PVDBOW) learning methods, from the Word embeddings methods is that it uses documents as input [64].

After the features at different levels are extracted, the newly formed matrix is directed to the feature selection stage.

2.4. Feature Selection

The high size of the matrix obtained after feature extraction necessitates reducing it to controllable dimensions before the information extraction stage. In this context, the process of identifying features that will potentially contribute to the analysis is called feature selection. Extra trees, which are an ensemble expansion of the random forest approach, are often preferred when the datasets are very large, especially in terms of bias, high variance and computational ease [65]. In this approach, different from the random forest approach, different decision trees are derived by considering the entire data set and learning is performed by combining them with an ensemble approach.

2.5. Information Extractaion

The information extraction stage is basically the fulfillment of data mining tasks such as classification, clustering, etc. on the matrix from the feature selection stage. In this study, the ensemble model, in which two different binary classification approaches are integrated, is organized as follows.

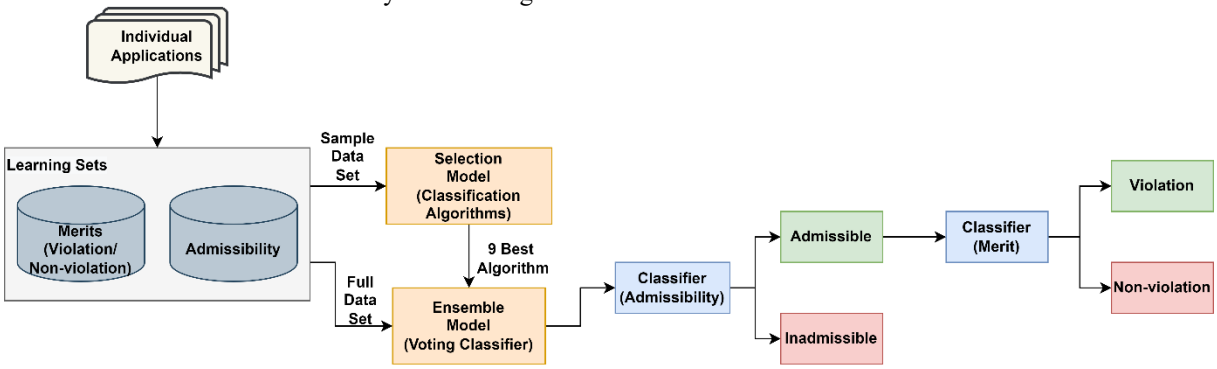


Figure 3. Two-stage classification-based integrated information extraction model

One of the important problems in machine learning approaches is overfitting and various methods are used to avoid this situation [66]. In this study, cross validation (k=10) was preferred to reduce the effect of heterogeneous learning sets on the learning process [67]. In addition, considering the excessive learning tendency of some classification models, the ensemble model was established in which the learning of different numbers of models was evaluated together [68]. Thanks to this model, it has been tried to reduce the effects of overift models on total performance with integrated evaluation instead of making a single model's learning performance-oriented estimation [69, 70]. In this two-stage classification model, first of all, predictions are made with a large number of classification models in a part of the data set. Afterwards, a pretrained model is created by integrating the algorithms with the best performance in an ensemble approach in order to make a prediction across the whole data set.

3. RESULTS

The information to be interpreted in the study was obtained in 5 stages, as depicted in Figure 4 below, depending on the the process given in the methodology section.

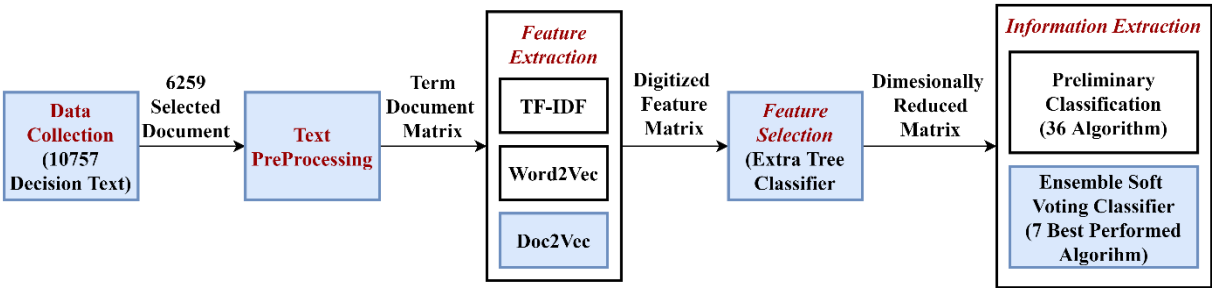


Figure 4. Text mining application process of the study

First, the data collection process was carried out. In this sense, CCT's individual application judgments, which are shared openly on https://kararlarbilgibankasi.anayasa.gov.tr, have been extracted to form a document corpus. The "Facts" heading, which summarizes the events that the applicant went through and the stages that the legal matter subject to the application went through before coming before the CCT, was extracted from the total of 10757 decision texts obtained. In order to eliminate the possible negative impact of very long and short documents on vector transformations, the size of the model data can be reduced by removing relevant documents [71]. Afterwards, in order not to affect the performance of the learning process, very short (less than 2500 characters) and very long (more than 20000 characters) documents were excluded from the corpus and the size was reduced to 6259 documents. In addition, 24 Rights/Liberties, 259 Intervention Claims and 38 Reparation categories for each decision text were drawn and added to the model as attributes. General summary information about the data set is given in table 2.

Table 2. Overview of the corpus

Decision Type	Number of Decision	Character Count			Word Count		
		Min.	Avg.	Max.	Min.	Avg.	Max.
Merit (Violation)	5786 (2955*)	119	5644	117319	25	717	16498
Merit (Non-Violation)	705 (532*)	414	13780	416526	49	1766	53436
Inadmissable	4266 (2732*)	112	6410	156215	18	816	20476
Total	10757 (6259*)	112	6485	416526	18	825	53436

* Number of decision texts with more than 2500 characters and less than 20000 characters

In the data preprocessing processes, after uniting, standardization and filtering processes, low-frequency words (96820 words that occur less than 10 times) were eliminated and the data set was finalized [74]. For the digitization of the processed data set, three different methods, which are frequently preferred in the literature, were used. The methods were evaluated with their classification process performances. The Doc2Vec document-level digitizing vector space model gave better results than the other models in both merit and admissibility evaluations in terms of four different classification performance criteria.

Table 3. Performance of Feature Extraction methods in different classification models

	Merit (Violation / Non-Violation)				Admissibility			
	Accuracy	Recall	Precision	F1 Score	Accuracy	Recall	Precision	F1 Score
TF-IDF	0.6716	0.6717	0.6751	0.6685	0.7597	0.7597	0.7664	0.7577
Word2Vec	0.8117	0.8117	0.8179	0.8099	0.8411	0.8411	0.8430	0.8408
Doc2Vec	0.8183	0.8183	0.8203	0.8178	0.8522	0.8523	0.8535	0.8521

Although the Doc2Vec model achieved high performances in the merits and admissibility classification models with 0.8183 and 0.8522, respectively, it was evaluated that these values may have potential to be improved. The fact that the size of the vector space model can be very large in document level models brings feature selection approaches to the fore. In this sense, the feature selection model was run with the extra tree classifier method in order to improve the analysis results. The confusion matrix and performance indicators for the feature selection model run separately for both classification sets are given in Tables 4 and 5.

Table 4. Classification Set 1 (Merit) model performances with extra tree classifier feature selection algorithms

		Actually		Model Performances	
		Positive (1)	Negative (0)		
Predicted	Positive (1)	(True Positive) 496	(False Positive) 35	Accuracy	0.8832
				Recall	0.8833
	Negative (0)	(False Negative) 89	(True Negative) 442	Precision	0.8907
				F1 Score	0.8827

Table 5. Classification Set 2 (Admissibility) model performances with extra tree classifier feature selection algorithms

		Actually		Model Performances	
		Positive (1)	Negative (0)		
Predicted	Positive (1)	(True Positive) 2294	(False Positive) 437	Accuracy	0.9030
				Recall	0.9030
	Negative (0)	(False Negative) 93	(True Negative) 2638	Precision	0.9098
				F1 Score	0.9025

It has been observed that the performance of the classification model established for the estimation of the substantive examination (merit) increased significantly in terms of all four performance criteria, and the accuracy value increased up to 0.8832. Similarly, it is seen that the classification performances of the admissibility evaluation have also increased, and the accuracy value has been increased from 0.8522 to 0.9030.

Random forest was used as the main estimator in all trials during the feature engineering process. After this stage, it is aimed to increase the overall performance by using different classification models. In the classification model, which was constructed in two stages from the information extraction stage, 36 different classification algorithms, which have been successfully used in text classification in the literature, were trained with a sample data set and the 7 most successful ones were selected for use in the ensemble model. Selected models and accuracy values are given in Table 6.

Table 6. Performance evaluation of top performed algorithms for ensemble model

	Merit	Admissibility
Histogram-Based Gradient Boosting Classification Tree	0.9633	0.9162
Linear Discriminant Analysis	0.9821	0.9154
Ridge Classifier	0.9821	0.9154
Gradient Boosting	0.9869	0.9130
Random Forest	0.8832	0.9030
Logistic Regression	0.8446	0.8940
AdaBoost Classifier	0.9840	0.8936

In the ensemble model, it was preferred to integrate the soft vote/majority vote classifier method. Therefore, an odd number of (7) high performance algorithms is included in the integrated model. Confusion matrices and performance values for the generated ensemble model are given in Tables 7 and 8.

Table 7. Ensemble learning model performance results for Classification Set 1 (Merit)

		Actually		Model Performances	
		Positive (1)	Negative (0)		
Predicted	Positive (1)	(True Positive) 531	(False Positive) 0	Accuracy	0.9718
				Recall	0.9718
	Negative (0)	(False Negative) 30	(True Negative) 501	Precision	0.9737
				F1 Score	0.9717

Table 8. Ensemble learning model performance results for Classification Set 2 (Admissibility)

		Actually		Model Performances	
		Positive (1)	Negative (0)		
Predicted	Positive (1)	(True Positive) 2271	(False Positive) 460	Accuracy	0.9156
				Recall	0.9155
	Negative (0)	(False Negative) 1	(True Negative) 2730	Precision	0.9277
				F1 Score	0.9149

4. DISCUSSION AND CONCLUSION

Our study is the first systematic study that attempts to predict the admissibility and merits of the Constitutional Court's individual application decisions (two-stage binary classification task) by processing the heading of “Facts” of these decisions using machine learning and NLP techniques, and our model achieved 97.18% success rate. In two studies with the CCT’s datasets, Sert et al. [33] 0.90 and Mumcuoğlu et al. [7] achieved 0.918 success rates. It is worth explaining the similarities and differences between our study and the two studies [7, 33], which are important in terms of the methodology used and utilizing the CCT’s decisions in order to shed light on the innovative aspect of our work. First of all, it should be underlined that, unlike the aforementioned study by Sert et al. [33], our study aims to teach court decisions to artificial intelligence in aggregate by using all available data without categorizing a certain right (not only public morality and freedom of expression) and to measure the overall success of the system by randomly selecting court decisions to be used for testing. Moreover, unlike Sert et al. [33] and Mumcuoğlu et al. [7], this study first aims to predict whether the application is admissible or not and then to predict whether a right has potentially been violated on the merits. Therefore, in this study, there is a two-stage process, each consisting of a binary classification task. In this respect, this study is more inclusive in that it aims to develop a system capable of predicting the Constitutional Court's decisions on both admissibility and merits and is more representative in that it aims to use a more comprehensive data set. On the other hand, to the best of our knowledge, such a study, which conducts a two-stage prediction in terms of admissibility and merits, has been conducted before, neither in Turkey nor in other countries. In this respect, this study sets a unique example in this area.

On the other hand, in Sert et al.'s [33] study, the machine was taught the "the subject of the application" and "the evaluation" headings of the Constitutional Court judgments. In particular, the evaluation heading is the heading where the Constitutional Court explains its opinion on the case in detail. Teaching the machine, the evaluation and law headings in court decisions has been criticized in the literature for increasing the potential of the machine to be "biased" [8]. In this study, in line with the preference of Mumcuoğlu et al. [7], we aim to teach the machine the "Facts" heading of the judgments and predict whether there is a possible violation of rights. Finally, Sert et al. [33] used the "data augmentation" method for the decisions in the category of "general morality" and Mumcuoğlu et al. [7] used the "data augmentation" method for all decisions of the Constitutional Court since the dataset they used was unbalanced. Coulombe [72] stated that there are methods for data augmentation in texts such as adding noise to the text, inserting spelling errors, replacing words with synonyms, annotating with regular expressions, annotating with syntax trees, and annotating with back translation. It is not specified which of these methods were used in this study. All of these methods try to preserve the basic statistics and distribution of the data. If data augmentation is done only on a sample with features extracted, this can easily mean generating data from which classification algorithms can learn [72]. In our study, such a method is not preferred, and the dataset is created in a balanced manner based on the available data from the beginning, in order to create a model that is appropriate for producing predictions that are closer to reality. Working on ECHR decisions in similar studies, Aletras et al. [25] 0.79 and Medvedeva et al. [8] reached 0.77 accuracy values. In our study, both different methods were used, and a very high decision was examined compared to these two studies. Therefore, our study here has shown very high success compared to these two studies.

In the future studies, decisions such as political party closure cases, constitutionality audit and administrative cases, which fall within the jurisdictive scope of the Constitutional Court, can also be predicted. Although the model presented in the study works on the draft decisions of the constitutional court rapporteur, it can be expanded to support other court decisions by making the necessary adjustments. In addition, the methods used here can be compared by applying to the European Court of Human Rights or court decisions of other countries. Furthermore, it is possible to apply our method to decisions written in other languages because our method is language independent. Finally, with the "active learning" approach that supports the active participation of decision makers in the machine learning process, potential problems that may arise due to technical legal language can be avoided.

Acknowledgement

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