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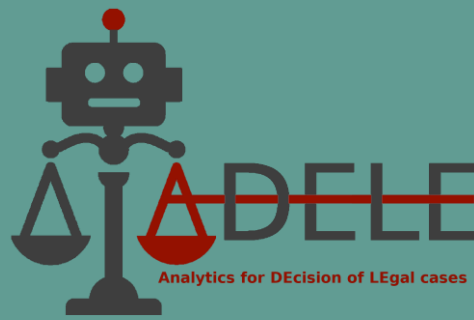
## Deliverable 4.2

### Demo Version of the Pilot Tool

<b>Grant Agreement n°:</b>	101007420
<b>Project Acronym:</b>	ADELE
<b>Project Title:</b>	Analytics for DEcision of LEgal cases
<b>Website:</b>	<a href="https://site.unibo.it/adele">https://site.unibo.it/adele</a>
<b>Contractual delivery date:</b>	30/09/2022
<b>Actual delivery data:</b>	07/10/2022
<b>Contributing WP</b>	WP4
<b>Dissemination level:</b>	Public
<b>Deliverable leader:</b>	APIS EUROPA
<b>Contributors:</b>	UNIBO, UNITO



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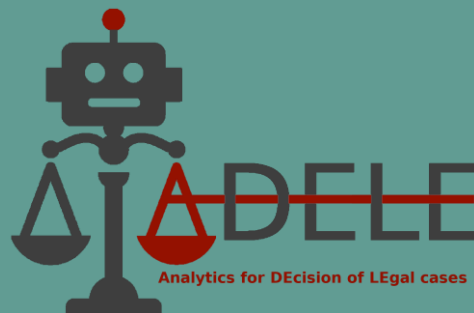
## 1. Document History

Version	Date	Author	Partner	Description
1.0	30/09/2022	Hristo Konstantinov	APIS	First draft
1.1	03/10/2022	Dilyana Bozhanova, Lilia Kachoreva	APIS	Review and minor revisions
1.2	04/10/2022	Hristo Konstantinov	APIS	Final draft
2.0	05/10/2022	Federico Galli	UNIBO	Review and addition of UNIBO task
2.1	06/10/2022	Galileo Sartor	UNITO	Addition of UNITO task
3.0	07/10/2022	Giovanni Sartor, Giuseppe Contissa, Federico Galli	UNIBO	Final version

## 2. Contributors

Partner	Name	Role	Contribution
APIS	Hristo Hristov, Daniel Traykov, Vasil Oreshenski, Julian Lazarov	WP leaders	Development of the demo version of the pilot tool
UNIBO (DiSi)	Paolo Torroni, Elena Palmieri, Giulia Grundler, Andrea Galassi	WP Participant	Development of models for automated argument extraction and outcome prediction
UNITO	Galileo Sartor, Luigi Di Caro	WP Participant	Network and citation analysis
UNIBO (Cirsfid)	Piera Santin, Federico Galli, Alessia Fidelangeli, Giuseppe Contissa, Francesca Lagioia	WP Participant	Network and citation analysis; Corpus annotation and guidelines revisions.

**Disclaimer:** On behalf of APIS EUROPA, the present deliverable has been drafted by Hristo Konstantinov, Dilyana Bozhanova and Lilia Kachoreva.

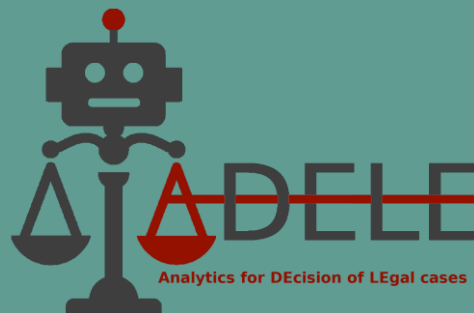


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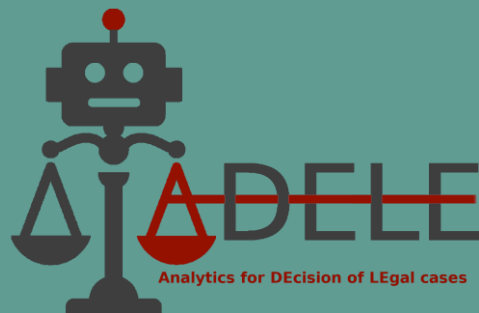
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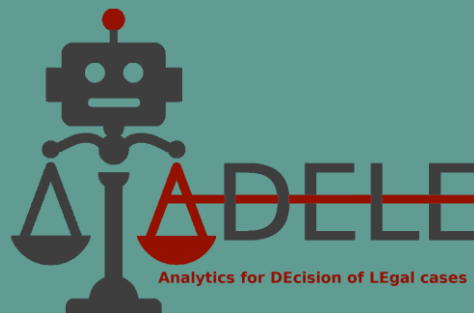


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## 6. List of Acronyms

AI	Artificial Intelligence
APIS	Apis Europa, beneficiary in ADELE project
CJEU	Court of Justice of the European Union
EU	European Union
EUI	European University Institute, beneficiary in ADELE project
LIBRe	LIBRe Foundation, beneficiary in ADELE project
ML	Machine Learning
NLP	Natural Language Processing
TM&P	Trademark and patents
UNIBO	University of Bologna, coordinator of ADELE project
VAT	Value Added Tax
WP	Work package



## 7. Introduction

This deliverable presents a demo version of the ADELE pilot tool, which is implemented as a web application freely accessible on <https://adele-tool.eu>.

The demonstrator incorporates the key content and features of the tool. The aim of this early version is to allow ADELE partners to demonstrate the provisional functionalities of the platform at two preliminary test events with judges in Italy and Bulgaria and gain feedback on its features. The received opinions and recommendations from the target users will facilitate and favour the development of the fully functional final version of the tool.

Since the pilot tool is a constantly evolving and updating legal database and software, the goal of the present document is to provide a brief overview on the status of the platform development at the stage of launching its demo version.

## 8. Brief Description of the Published Legal Content

### 8.1. Legislation

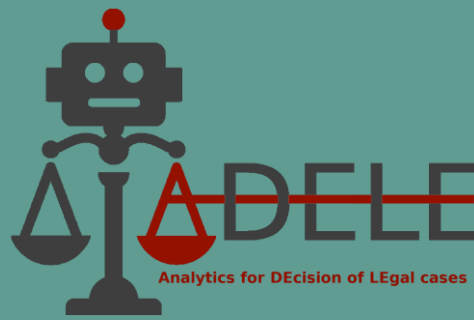
ADELE pilot tool provides access to the main instruments of EU law and the national legislations of Italy and Bulgaria in the chosen legal domains – VAT and Trademark and patents. Besides the consolidated texts of the acts currently in force, the tool's database includes a number of repealed legislative instruments that are often cited in judicial decisions.

Table 8-1 below provides information about the number of legislative instruments included in the demo version of the tool per legal domain and jurisdiction. Clicking the links in the table will open a list of documents in the pilot tool for the respective legal domain and jurisdiction.

	Value Added Tax	Trademark and patents
European Union	<a href="#">25</a>	<a href="#">20</a>
Bulgaria	<a href="#">16</a>	<a href="#">10</a>
Italy	<a href="#">9</a>	<a href="#">8</a>

*Table 8-1. Number of legislative instruments included in the demo version of ADELE pilot tool*

The demo version does not include time versions of the legislative instruments.



## 8.2. Case Law

The demo version of the pilot tool contains 861 anonymised and annotated decisions of Italian and Bulgarian courts as well as 263 non-annotated decisions of the Court of Justice of the European Union (CJEU) in the chosen legal domains – VAT and Trademark and patents. The annotations have been performed by legal experts of the partners UNIBO, EUI, APIS and LIBRe in XML format according to the annotation guidelines elaborated with Deliverable 2.1, later updated and finalised with Deliverable 2.2.

Table 8-2 below summarises the number of decisions included in the demo version of ADELE pilot tool per legal domain and jurisdiction. Clicking the links in the table will open a list of documents in the pilot tool for the respective legal domain and jurisdiction.

	Value Added Tax	Trademark and patents
Court of Justice of the EU	<a href="#">245</a>	<a href="#">28</a>
Bulgarian courts	<a href="#">217</a>	<a href="#">179</a>
Italian courts	<a href="#">235</a>	<a href="#">230</a>

*Table 8-2. Number of court decisions included in the demo version of ADELE pilot tool*

## 9. Current Status of the Implemented Functionalities

### 9.1. Legal databases functionalities

The ADELE pilot tool offers a number of basic functionalities for browsing and searching documents that a typical for legal databases.

#### 1) *Browsing documents*

The ADELE platform provides access to four document collections divided by country and legal domain:

- Bulgaria – Value added tax, Trademark and patents
- Italy – Value added tax, Trademark and patents.

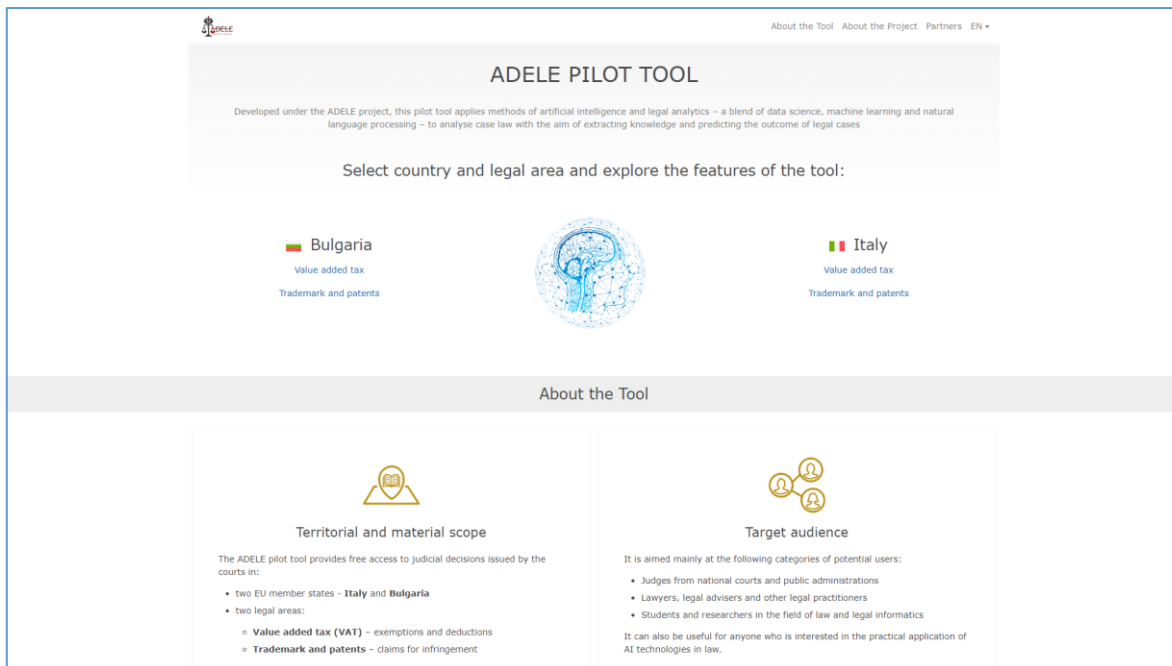
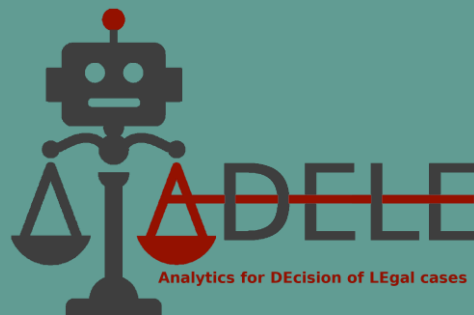


Figure 9-1. Home screen of ADELE pilot tool with options for choosing country and legal domain

The choice of a particular document collection leads users to the main page of the tool where they can browse several lists of documents according to their type by clicking on any of the four buttons above the list:

- *National case law* – decisions of courts or other judicial authorities of Italy or Bulgaria in the chosen legal domain
- *National legislation* – main legislative instruments of Italy or Bulgaria in the chosen legal domain
- *EU case law* – relevant judgments of the CJEU in the chosen legal domain in Italian or Bulgarian language (depending on the selected country)
- *EU legislation* – relevant instruments of EU law in the chosen legal domain in Italian or Bulgarian language (depending on the selected country).

Documents in each list can be filtered by one or more criteria that are specific for the respective document collection, e.g. by court, case outcome or year of the decision.



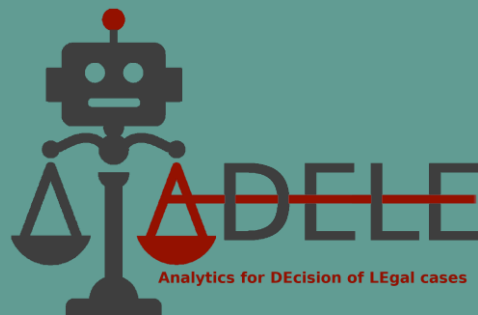
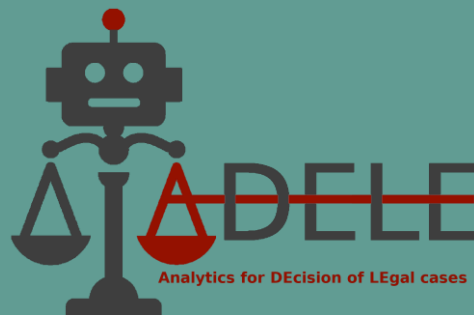


Figure 9-2. Main page of ADELE tool with lists of documents and filters

## 2) Searching documents and filtering search results

Users can perform searches in the four document collections by entering a keyword or a key phrase in the search box above the document list. The result is a list of documents containing the search expression. The list could be further filtered by using one or several filters.

Figure 9-3. Search results in ADELE tool



Opening a document in the list of search results displays the highlighted matches of the searched keywords within the text. The three buttons on the left side of the search box allow users to select next or previous match or remove the highlighting.

### 3) Table of contents

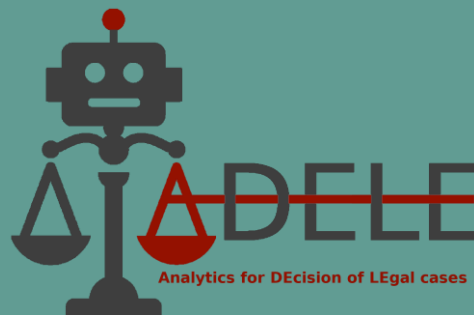
Where documents, such as instruments of national or EU legislation, have a complex hierarchical structure, users can navigate between the individual sections of the document via a table of contents in the panel on the left. When selecting an element in the table, the text of the document is positioned on the corresponding section. In addition, users can make quick searches in the text of the structural elements in the table of contents.

The screenshot shows the ADELE tool interface for a document titled "Закон за данък върху добавената стойност" (Law on Value Added Tax). On the left, there is a "TABLE OF CONTENTS" panel with a search filter and a list of sections. The main content area shows the text of the law, starting with the title and the first article: "Чл. 1. Този закон урежда облагането с данък върху добавената стойност (ДДС)." The interface also includes a "Metadata" section and a "Filter..." input field.

Figure 9-4. Table of contents in ADELE tool

### 4) Inline links to cited documents

Citations to other legal documents within the text of judicial decisions are provided in the form of inline links. Clicking on a link opens the cited document. If a particular provision of a legislative act is cited, then the text of the open document is positioned on the cited provision.



As part of the performed citation analysis, a special icon is placed next to each link. Clicking on this icon brings up a list of all documents that cite the same document or provision. This feature is especially convenient as it allows users to easily and quickly find other court decisions citing the same legal rule or judicial precedent.

## 9.2. AI and ML-powered functionalities

The demo version of ADELE pilot tool offers the following features that are based on the application of specific AI and ML methods and techniques:

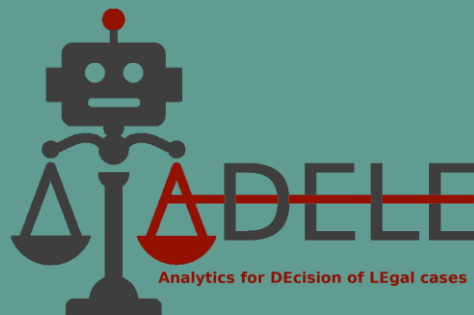
### 1) *Automatically extracted key terms*

Providing a set of relevant key terms (keywords) facilitates legal information retrieval by assisting users quickly to understand the main factual and legal issues discussed in a particular case without reading its text. In the demo version of the pilot tool, key terms are displayed under the title of judicial decisions in lists of documents as well as in an open document. Depending on the length of the decision, between 5 and 15 key terms are usually shown.

The screenshot displays the ADELE pilot tool interface. At the top, there is a search bar and navigation tabs for 'National Case Law (217)', 'National Legislation (16)', 'EU Case Law (251)', and 'EU Legislation (22)'. Below the search bar, there are filters for 'ANNOTATION' and 'COURT'. The main content area shows a list of documents with their titles and automatically extracted key terms. The key terms are highlighted in red. The documents listed include:

- Решение № 11006 от 2.11.2021 г. на ВАС по адм. д. № 8238/2021 г., I о., докладчик председателат Мариника Чернева
- Решение № 9732 от 28.09.2021 г. на ВАС по адм. д. № 3204/2021 г., VIII о., докладчик съдията Тания Консалова
- Решение № 9636 от 27.09.2021 г. на ВАС по адм. д. № 2684/2021 г., VIII о., докладчик съдията Росица Драганова
- Решение № 8692 от 19.07.2021 г. на ВАС по адм. д. № 2646/2021 г., VIII о., докладчик съдията Станимира Друмева
- Решение № 7767 от 29.06.2021 г. на ВАС по адм. д. № 1933/2021 г., VIII о., докладчик съдията Росица Драганова
- РЕШЕНИЕ № 7131 от 14.06.2021 г. на ВАС по адм. дело № 13554/2020

Figure 9-5. Automatically extracted key terms in a list of documents



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Users can click on each key term in the list of the automatically extracted keywords, which leads to highlighting all its occurrences within the text of the decision.

The automated key term extraction is performed by a trained spaCy model based on Named Entity Recognition (NER). For training of the dataset two specialised dictionaries were used containing legal terms in the relevant fields of law – one in the field of VAT and one in the field of TM&P law. They were compiled by legal experts of APIS project team. In addition, a few more general law-related dictionaries such as EuroVoc are exploited. The applied model labels the key terms recognised in the text of a decision in two categories: the terms from the specialised dictionaries are labelled as priority key terms, whereas those contained in other dictionaries are labelled as non-priority key terms. The terms that the trained model classifies as priority key terms are directly included in the final selection, whereas the KeyBERT library (Grootendorst, 2020) is used for the non-priority keywords to extract only those keywords that are most relevant to the processed document. However, before using KeyBERT, additional filtering is applied for the non-priority key terms. For instance, only non-priority key terms that have at least two occurrences within the text of the processed document are included.

## **2) *Automatically extracted case summaries***

Similar to automatically extracted key terms, the aim of this feature is to help users quickly grasp the essence of the case by extracting key arguments (sentences or paragraphs) from the argumentative part of the decision. A summary is not generated for decisions that contain already a summary (an abstract) produced by a legal expert. During the experiments, it became obvious that it does not make much sense to generate a summary also in cases where the argumentative part of a decision is very short.

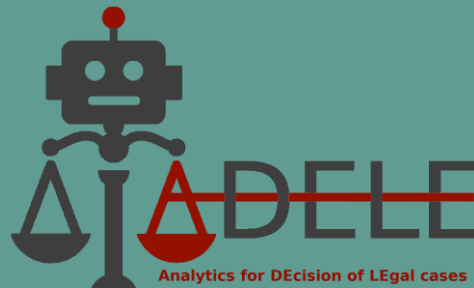
In the demo version of the pilot tool, the automatically generated summaries are displayed in lists of documents or in open documents under the title of judicial decisions, just below the automatically extracted key terms. Clicking on a sentence (or group of sentences) in a summary highlights this item within the text of the decision so that users can explore the context in which it was used.

The first experiments with text summarisation started by using the TextRank model<sup>1</sup>, but the results were not satisfactory. Therefore, it was decided to train a spaCy model<sup>2</sup> on a dataset of about 40.000 Bulgarian court decisions summarised manually by legal experts. The model is based on sentence text categorisation, where the aforementioned manually annotated data were used to generate a

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<sup>1</sup> <https://cran.r-project.org/web/packages/textrank/vignettes/textrank.html>.

<sup>2</sup> <https://spacy.io/usage/models>.



training dataset containing two categories of sentences: *summary* and *not\_summary*. The applied approach led to a significant improvement of the results for the Bulgarian decisions.

For Italian decisions, initially we also tried to apply the TextRank model. Since again the results were not satisfactory, we used the trained “Bulgarian” spaCy model, because it was based on a multilingual transformer. In this way, we received far better results.

The screenshot displays the ADELE web application interface. At the top, there is a search bar and navigation tabs for 'National Case Law (217)', 'National Legislation (16)', 'EU Case Law (251)', and 'EU Legislation (22)'. Below the search bar, there are filter sections for 'ANNOTATION', 'COURT', and 'YEAR'. The main content area shows a list of documents, each with a title, a date, and a court reference. For each document, there are sections for 'Automatically extracted keywords' and 'Automatically extracted summary'. The first document is 'Решение № 11006 от 2.11.2021 г. на ВАС по адм. д. № 8238/2021 г., I о., докладчик председателят Мариника Чернева'. The second is 'Решение № 9732 от 28.09.2021 г. на ВАС по адм. д. № 3204/2021 г., VIII о., докладчик съдията Тана Консалова'. The third is 'Решение № 9636 от 27.09.2021 г. на ВАС по адм. д. № 2684/2021 г., VIII о., докладчик съдията Росица Драганова'. The fourth is 'Решение № 8692 от 19.07.2021 г. на ВАС по адм. д. № 2646/2021 г., VIII о., докладчик съдията Станимира Друнева'. At the bottom of the interface, there is a footer with a disclaimer: 'The ADELE project is co-funded by the Justice Programme of the European Union (2014-2020). The content of this website represents the views of the partners of the ADELE project and is their sole responsibility. The European Commission does not accept any responsibility for use that may be made of the information it contains.'

Figure 9-6. Automatically extracted case summaries in a list of documents

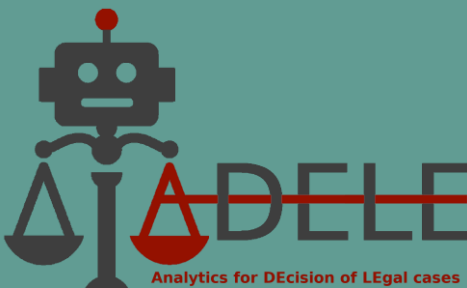
### 3) Citation analysis

The demo version of ADELE pilot tool provides an initial implementation of several features based on the citation and network analysis performed by the ADELE partners.

First of all, the recognised legal citations to EU and national legislation and case law in the text of the decisions appear in the form of in-line links. Clicking such a link opens the text of the cited document either in ADELE tool (when it is available there in full text) or in another online legal database (e.g., EUR-Lex portal).

Secondly, when clicking on the small icon next to an on-line link, a new browser window opens containing a list of documents that cite the same judicial decision or legislative act, respectively the





same provision of the legislative act. Thus, users are able to find potentially comparable cases that refer to the same legal document and discuss similar legal issues.

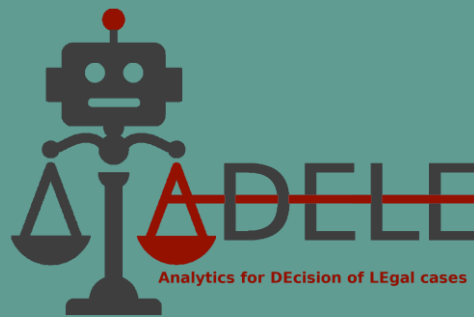
Thirdly, based on in- and out-citations, for each open document users can produce lists of all documents that are citing or are cited by that particular document. To this end, they could use the two buttons above the text of the open document: “Links to the document” or “Links from the document”.

The screenshot displays the ADELE web interface for a Bulgarian VAT decision. At the top, there are two buttons: "Links to the document (0)" and "Links from the document (12)". The main content area shows the text of the decision, with several in-line links and icons. A blue box highlights a specific paragraph of text, and a red box highlights a citation link. The interface includes a sidebar with navigation options like "INTRODUCTION", "PRE-LITIGATION DECISIONS", and "DECISION OF THE COURT".

Figure 9-7. Examples of in-line links and the buttons for in- and out-citations

Finally, the demo version of ADELE pilot tool provides an option for the user to assess the importance of national and EU cases by receiving statistics of the most cited documents. This feature is available by clicking the “Citation Analysis” button on the top of the screen. It produces two lists of the most cited decisions of national courts and judgments of the CJEU for the respective legal domain and country (e.g. VAT decisions of Bulgarian courts) ranked by citation frequency. The number in parentheses before the title of a decision indicates the number of documents in the ADELE database that cite that particular document. Clicking on the small icon before the title of the decision generates a list of all decisions citing it.

The citations were initially extracted by using regular expressions with the assistance of legal experts. Once



extracted, metadata regarding these cases was searched in different publicly available judicial databases. This information was collected in a database, keeping track of the citations.

Once the collection of citations was complete, the data was analysed with different network analysis tools. Initially, we were interested in sorting the cases by number of citations (direct and indirect). To do so, we found that the *degree centrality* algorithm was the most effective.

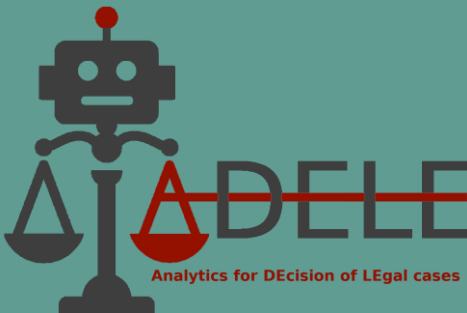
The network of citations will be further enhanced by adding more decisions based on the expansion of the dataset. Furthermore we will evaluate its usefulness in combination with the ontological framework, which is currently being developed.

Bulgaria value added tax		EN	
Citation analysis: list of most cited documents			
National Case Law		EU Case Law	
(6) Тълкувателно решение № 5 от 13.12.2016 г. на ВАС по т. д. № 10/2016 г., ОСС, I и II колегия, докладвано от съдията Йордан Константинов		(67) Решение на Съда (трети състав) от 6 декември 2012 г. Боник EOOD срещу Директор на дирекция „Обжалване и управление на изпълнението“, Варна, при Централно управление на Националната агенция за приходите...	
(4) Решение № 6047 от 26.05.2015 г. на ВАС по адм. д. № 8024/2014 г., I о., докладчик съдията Милена Златкова		(63) Решение на Съда (трети състав) от 21 юни 2012 г. Mahagöben Kft срещу Nemzeti Adó- és Vámhivatal Dél-dunántúli Regionális Adó Főigazgatósága (C-80/11) и Péter Dávid срещу Nemzeti Adó- és Vámhivatal Észak-magyarországi Regionális Adó Főigazgatósága. Преюдициално запитване, отправено от Letifelsőbb Bíróság, Данциг...	
(2) Решение № 15412 от 15.12.2009 г. на ВАС по адм. д. № 7436/2009 г., I о., докладчик съдията Атанаска Дишева		(49) Решение на Съда (трети състав) от 6 септември 2012 г. Gábor Tóth срещу Nemzeti Adó- és Vámhivatal Észak-magyarországi Regionális Adó Főigazgatósága. Преюдициално запитване, отправено от Letifelsőbb Bíróság, Данциг...	
(2) Решение № 164 от 5.01.2012 г. на ВАС по адм. д. № 2642/2011 г., VIII о., докладчик съдията Бисерка Цанева		(42) Решение на Съда (седми състав) от 13 февруари 2014 г. Maks Pen EOOD срещу Директор на Дирекция „Обжалване и даначно-осигурителна практика“ София. Искане за преюдициално заключение: Administrativen sad...	
(2) Решение № 16572 от 11.12.2013 г. на ВАС по адм. д. № 11266/2013 г., I о., докладчик председателят Йордан Константинов		(34) Judgment of the Court (Grand Chamber) of 21 February 2006. Halifax plc, Leeds Permanent Development Services Ltd and County Wide Property Investments Ltd v Commissioners of Customs & Excise. Reference for a...	
(2) Решение № 252 от 10.01.2017 г. на ВАС по адм. д. № 11876/2015 г., VIII о., докладчик съдията Аглика Адамова		(24) Judgment of the Court (Third Chamber) of 6 July 2006. Axel Kittel v Belgian State (C-439/04) and Belgian State v Recolta Recycling SPRL (C-440/04). Reference for a preliminary ruling: Cour de cassation - Belgium, Sixth VAT...	
(2) Решение № 518 от 16.01.2017 г. на ВАС по адм. д. № 8295/2015 г., I о., докладчик съдията Малена Златкова		(21) Решение на Съда (трети състав) от 29 октомври 2009 г. Skatteverket срещу AB SKF. Искане за преюдициално заключение: Regeringsrätten - Швеция. Шеста директива ДДС - Членове 2 и 4, член 13, Б, буква г), точка 5 и...	
(2) Решение № 17200 от 16.12.2019 г. на ВАС по адм. д. № 7649/2019 г., VIII о., докладчик съдията Свиленка Проданова		(21) Решение на Съда (втори състав) от 16 февруари 2012 г. „ЕОН Асет Менеджмент“ ООД срещу Директор на дирекция „Обжалване и управление на изпълнението“, гр. Варна, при Централно управление на Националната...	
(2) Решение № 15687 от 19.11.2019 г. на ВАС по адм. д. № 8091/2019 г., I о., докладчик председателят Йордан Константинов		(20) Решение на Съда (втори състав) от 6 септември 2012 г. Meseck-Gabona Kft срещу Nemzeti Adó- és Vámhivatal Dél-dunántúli Regionális Adó Főigazgatósága. Преюдициално запитване, отправено от Baranya Megyei Bíróság, ДДС...	
(2) Решение № 5513 от 12.05.2020 г. на ВАС по адм. д. № 1418/2020 г., I о., докладчик съдията Мария Радева		(19) Judgment of the Court (Sixth Chamber) of 25 February 1999. Card Protection Plan Ltd (CPP) v Commissioners of Customs & Excise. Reference for a preliminary ruling: House of Lords - United Kingdom. Sixth VAT Directive - ...	
(1) Определение № 3109 от 27.09.2010 г. на АдМС - София по адм. д. № 6211/2010 г.		(19) Решение на Съда (голям състав) от 7 декември 2010 г. Нисазателно производство срещу R. Искане за преюдициално заключение: Bundesgerichtshof - Германия. Шеста директива ДДС - Член 28а, А, буква а) - ...	
(1) Решение № 5623 от 4.09.2014 г. на АдМС - София по адм. д. № 5346/2013 г.		(18) Решение на Съда (трети състав) от 31 януари 2013 г. „ЛВК - 56“ EOOD срещу Директор на дирекция „Обжалване и управление на изпълнението“ - град Варна при Централно управление на Националната агенция...	
(1) Решение № 4487 от 2.07.2014 г. на АдМС - София по адм. д. № 1003/2014 г.		(17) Judgment of the Court (Fifth Chamber) of 29 April 2004. Terra Baubedarf-Handel GmbH v Finanzamt Osterholz-Scharmbeck. Reference for a preliminary ruling: Bundesfinanzhof - Germany. Sixth VAT Directive - Article 17(1) and...	
(1) Решение № 2691 от 17.04.2015 г. на АдМС - София по адм. д. № 426/2014 г.		(17) Решение на Съда (трети състав) от 27 септември 2007 г. The Queen, по молба на Teles plc и други срещу Commissioners of Customs & Excise. Искане за преюдициално заключение: High Court of Justice (England...	
(1) Решение № 4590 от 30.06.2015 г. на АдМС - София по адм. д. № 1005/2014 г.		(17) Решение на Съда (втори състав) от 18 юли 2013 г. „Евита-К“ EOOD срещу Директора на дирекция „Обжалване и управление на изпълнението“, София, при Централно управление на Националната агенция за...	
(1) Решение № 2443 от 18.11.2015 г. на АдМС - Варна по адм. д. № 104/2015 г.		(16) Judgment of the Court of 21 March 2006. Gabalfrisa SL and Others v Agencia Estatal de Administración Tributaria (AEAT). Reference for a preliminary ruling: Tribunal Económico-Administrativo Regional de Cataluña - Spain. Meaning...	
(1) Решение № 2317 от 17.11.2016 г. на АдМС - Варна по адм. д. № 2420/2016 г.		(15) Judgment of the Court (Third Chamber) of 12 January 2006. Optigen Ltd (C-354/03), Fulcrum Electronics Ltd (C-355/03) and Bond House Systems Ltd (C-484/03) v Commissioners of Customs & Excise. Reference for a...	
(1) Решение № 678 от 3.02.2017 г. на АдМС - София по адм. д. № 3666/2016 г.		(15) Judgment of the Court (First Chamber) of 30 March 2006. Uudenkaupungin kaupunki. Reference for a preliminary ruling: Korkein hallinto-oikeus - Finland. VAT - Deduction of input tax - Capital goods - Immovable property - ...	
(1) Решение № 127 от 15.06.2017 г. на ОС - Кюстендил по в. гр. д. № 158/2017 г.		(15) Решение на Съда (втори състав) от 22 март 2012 г. „Клиб“ ООД срещу Директор на дирекция „Обжалване и управление на изпълнението“, Варна, при Централно управление на Националната агенция за приходите...	

Figure 9-8. Citation analysis: list of most cited Bulgarian VAT decisions and judgments of the CJEU

#### 4) Visual representation and highlighting of decision annotations

As already pointed out in [Section 8.2](#) above, the demo version of ADELE pilot tool contains the full set of XML files of Italian and Bulgarian decisions manually annotated by legal experts of the partners UNIBO, EUI, APIS and LIBRe according to the annotation guidelines elaborated with Deliverables 2.1 and 2.2. These annotated data are used as training dataset for all AI and ML tasks performed within the project framework.



The demo version provides a special functionality for a structured visual representation of the annotated elements of the decisions allowing users to navigate between different sections and pieces of text by highlighting judicial arguments and other annotated units. The annotations are visualised in the panel on the left of the decision text. They are presented in a structured form similar to a table of contents. In addition, judicial arguments are classified by type (legal, factual or legal-factual premises) and argumentation scheme (e.g. argument from rule, from precedent, from interpretation, etc.). The panel on the left displays further different argument chains where one or more arguments is/are a premise of another, thus forming linked lines of argumentation.

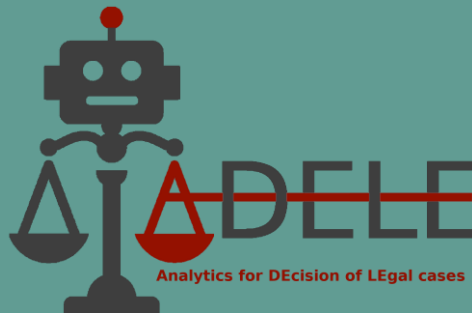
Clicking on an annotated element in the panel on the left leads to highlighting of the annotated piece of text on the right. Thus, users can browse the annotated elements, identify them within the text and perceive contextually their position and importance. In particular, the arguments highlighting feature aims to assist users in perceiving and exploring visually the complex argument chains of the judicial reasoning.

The screenshot displays the ADELE interface for a legal document. On the left, a sidebar provides a structured table of contents with categories such as 'PRE-LITIGATION DECISIONS', 'First instance proceeding', 'REQUESTS OF THE PARTIES', 'MOTIVATION OF THE COURT', 'DECISION OF THE COURT', 'Second instance proceeding', and 'MOTIVATION OF THE COURT'. Under 'MOTIVATION OF THE COURT', there is an 'Argument chain 1' section listing premises A1 through A6 and a conclusion A7. Below this, there are sections for 'Legal premises', 'Factual premises', 'Legal and Factual premises', 'By relationship with other arguments', and 'By argumentation scheme'. The main text area on the right shows the corresponding legal text with these elements highlighted. At the bottom, a panel titled 'Argument type: Legal premise' shows 'Relationships with other arguments: Supports: Premise A6' and 'Argumentation scheme: Argument from precedent'.

Figure 9-9. Structured visual representation and highlighting of annotated elements

A small horizontal panel under the decision's text indicates interdependences between the highlighted element and other annotated elements of the same decision. For instance, for each selected claim users can visualise information on which request of what party is supported by that





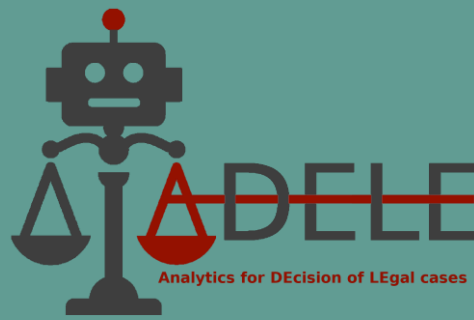
claim, which are the arguments of this party that support the claim and which findings of the court are related to that claim. As for judicial arguments, the below panel indicates the interconnections and interdependencies between arguments (whether an argument supports/attacks or depends on another one).

### 5) Automated argument extraction

This feature makes it possible for users to copy-paste in a specially designed form the text of a judicial decision and ask the tool to automatically identify, highlight and classify judicial arguments.

Figure 9-10. Example for using the automated argument extraction functionality: input and output

The visual representation, highlighting and classification of the arguments (premises and conclusions) is identical with the same features implemented for the manual expert annotations of the decisions as already described in pt. 4) above.



In the demo version of the pilot tool, the automated argument extraction feature is available only for Italian VAT cases. In order to use it, users have to click on the “Argument Extraction” button on the top of the screen. For Bulgarian decisions and Italian TM&P cases, this functionality is made available as a mock-up only, since the developed model is still being tested.

The automated argument extraction functionality is based on the data annotated following the argument mining guidelines included in D2.1 and D2.2. Based on these data, four tasks were performed:

- Argument Detection: given a sentence, classify it as premise, conclusion, or neither;
- Argument Classification: given a sentence that is known to be argumentative, classify it as premise or conclusion;
- Type Classification: a multi-label classification problem where a sentence that is known to be a premise is classified as legal and/or factual;
- Scheme Classification: a multi-label classification task where a sentence, known to be a legal premise, is classified according to its argumentative scheme.

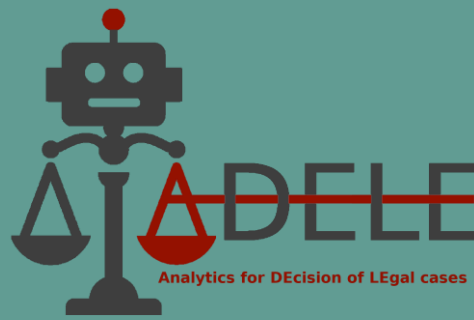
For all tasks we adopted three different representations of the input text, such as TF-IDF, Sentence-BERT (SBERT) (Reimers and Gurevych, 2019), Legal-BERT (Chalkidis et al., 2020). As classifiers, we have chosen a set of traditional machine learning techniques that have low computational requirements (e.g., Linear SVC, Random Forest, K Neighbors). The table below presents the average performance for each task considering both the embedding techniques and the classifier adopted.

Task	Embedding	Classifier	Score
Argument detection	TD-IDF	Linear SVC	0.70
Argument classification	TD-IDF	Random Forest	0.88
Type classification	LegalBert	SVC	0.85
Scheme classification	TD-IDF	Linear SVC	0.75

*Table 9-1. Experimental results in the argument mining task*

The tables containing complete results are presented and discussed in Grundler et al. (2022), accepted at ArgMining 2022: 9th Workshop on Argument Mining.

In future work, we aim to explore the use of over-sampling and data augmentation techniques to overcome the detected unbalance of classes in each task. We also want to study the impact of pre-processing and the use of alternative classifiers such as logistic regression. Finally, we aim to

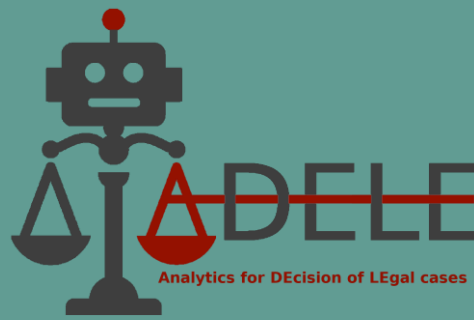


improve the robustness of our experimental findings, for example, by considering multiple seed runs or applying the method proposed by Lai et al. (2021).

### 6) Outcome prediction (mock-up)

As this feature is still in an experimental phase with Italian VAT cases, the partners decided to implement it in the demo version of the pilot tool as a mock-up only. The mock-up illustrates the input required from the user and the expected output in the form of a prediction of the outcome related to a particular request of party, possibly supported by particular claims and arguments. In order to use the mock-up, users have to click on the “Outcome Prediction” button on the top of the screen. Then, they have to type or copy-paste the request of a party to a particular legal case and one or more claims supporting this request in the text boxes of the “Outcome Prediction Form” that appears in a new window of the browser. Each claim, in turn, can be supported by one or more arguments. Claims and arguments can be added or removed by using the “Add claim / argument” and “Remove claim / argument” buttons. After typing or pasting the required input data concerning a request of a party to a legal case, users can click the “Predict” button in order to receive a prediction of the case outcome (“Uphold” or “Reject”) in relation to this particular request and a related confidence score.

Figure 9-11. Example for using the outcome prediction functionality: input and output



The outcome prediction functionality is based on training data annotated following annotation guidelines contained in D2.1 and D2.2. The ML task was to predict the court’s decisions on a single party’s request based on the information provided by the parties before the case. In particular, four experimental settings were considered: (1) request, claims, arguments; (2) request, claims, arguments, motivation; (3) request, claims, arguments, decision; (4) request, claims, arguments, motivation, decision. For each setting, we decided to perform two different experiments: (1) one in which we trained and test only on second-instance decisions, and (2) one where we also included first-instance decisions.

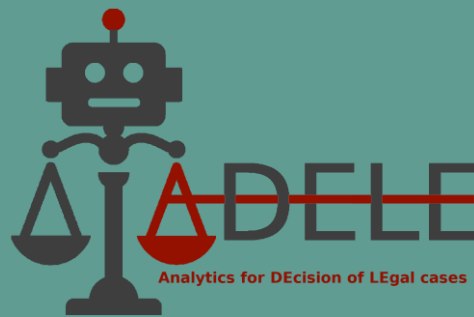
For each task, two representations techniques for input text were used, namely TF-IDF vectorization and Sentence-BERT (SBERT). As classifiers, we have chosen a set of traditional machine learning models with low computational requirements: Linear SVC, SVC, Random Forest, Gaussian Naive Bayes and K-Neighbours. The table below presents the average performance for each experimental setting considering both the embedding techniques and the classifier adopted.

Setting	w/o first-instance requests			w/ first-instance requests		
	Embedding	Classifier	Score	Embedding	Classifier	Score
Req, claims, args	SBERT	Linear SVC	0.68	TF-IDF	Linear SVC	0.69
Req, claims, args, mots	SBERT	Linear SVC	0.66	SBERT	Linear SVC	0.66
Req, claims, args, dec	SBERT	Linear SVC	0.68	TF-IDF	Random Forest	0.72
Req, claims, args, mots, dec	SBERT	Linear SVC	0.66	TF-IDF SBERT	Linear SVC	0.64

Table 9-2. Experimental results in the outcome prediction task

The tables containing complete results is presented and discussed in a paper recently submitted at JURIX 2022 Conference.

The ideal outcome of the outcome prediction task would consist in being able to predict the decision of the court on the basis of the information provided by the parties before the case. This task is approximated in our first experiments by predicting the outcome based on corresponding fragments in the narrative provided by courts, which we captured through the requests, claims, and arguments marked elements. To achieve this goal, we will experiment with more advanced techniques, such as



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neural architectures for classification and domain-specific embeddings. Finally, since our experiments suggested that the decision section contains useful information, but in a realistic setting it would not be available at testing time, we would like to focus our efforts on integrating its use during the learning process.

## 10. Future Work

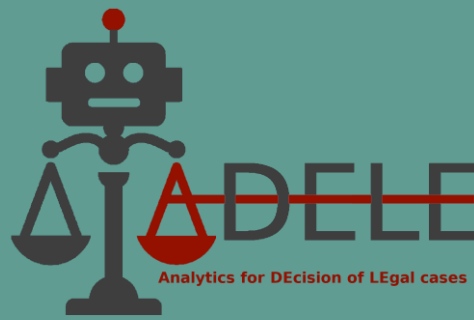
The first and foremost task of ADELE partners with regard to the continuing development of the pilot tool is to fully complete the key functionalities of automated argument extraction and outcome prediction, as well as improve annotated data and ML models as explained in Section 9.2.

Moreover, further efforts are needed also in order to improve existing and add new features based on citation and network analysis. Improvements of the present results of the models for automated extraction of key terms and case summaries, especially for Italian decisions, are also of utmost importance.

Third, a substantial part of the future activities will be aimed at completing the development of the following three functionalities, which ADELE partners had estimated to be only ready for the final version of the tool:

- *Search for similar cases* – users can ask the tool to deliver a list of decisions on factual or legal issues that are similar to the issues discussed in a decision opened by the user;
- *Search for similar arguments* – users can ask the tool to deliver a list of arguments in other decisions that are similar to a selected argument (or several consecutive arguments);
- *Visual presentation of ontology concepts* – users can navigate the ontology and its links to different parts of the decisions.

In conclusion, it can be stated that the demo version of ADELE pilot tool has fulfilled its main goal to illustrate the provisional functionalities of the online platform so that they can be demonstrated at the planned two preliminary test events with judges in Italy and Bulgaria. In addition to the remaining tasks, the opinions and recommendations to be received from the participants in these events will also be taken into account by the development of the fully functional final version of the tool.



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