v. 05, nº 02 - jul/dec 2025
ISSN 2763-8685

LATIN AMERICAN JOURNAL OF EUROPEAN STUDIES

BRIDGE WATCH
JEAN MONNET POLICY DEBATE

LACES
Latin American Center of European Studies

Co-funded by the European Union

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https://dx.doi.org/10.51799/2763-8685v5n2014

CONCIL-IA PROJECT:
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1. Maykon Marcos Júnior et al., "CONCIL-IA PROJECT: Final Findings and Digital Innovations for Conflict Resolution," *Latin American Journal of European Studies* 5, no. 2 (2025): 343 et seq.
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ABSTRACT: This article presents the results of the Concil-IA Project, an interdisciplinary initiative developed at the Federal University of Santa Catarina (UFSC) in partnership with the institution's Small Claims Court, aimed at creating an Artificial Intelligence (AI)-based Online Dispute Resolution (ODR) platform for consumer conflicts. The research consolidated its contributions into three main areas: predictive modeling, explainability, and validation of the digital interface. In the field of predictive modeling, a regression model was developed using 1,851 anonymized judicial decisions related to air transport disputes. Several Machine Learning techniques (Decision Tree, Random Forest, and AdaBoost) were tested, and the Decision Tree Regressor was selected for balancing performance, interpretability, and computational efficiency. The model achieved satisfactory results, with a mean absolute error of approximately R$ 1,672 and a root mean squared error of R$ 2,286, confirming its suitability for real-world conciliation scenarios. Regarding explainability, Explainable Artificial Intelligence (XAI) methods were applied through SHAP (SHapley Additive exPlanations). This approach enabled both global interpretation of the model and local explanations for specific cases, highlighting as the most relevant factors in compensation predictions the flight delay or cancellation and the absence of assistance provided by the airline. Finally, the model was incorporated into a responsive web platform (concilia.ufsc.br / app.concilia.ufsc.br), developed in WordPress and validated with conciliators and court staff. Usability tests, carried out through structured questionnaires, showed high levels of acceptance, with average scores between 4.8 and 5.0 in clarity, organization, comfort, and perceived effectiveness. The findings confirm the technical feasibility and institutional relevance of Concil-IA as a digital innovation for conflict resolution, particularly judicial conciliation. Future steps include expanding the dataset, applying the platform to other areas of law, and strengthening its interoperability with national digital justice policies.

KEYWORDS: Online Dispute Resolution; Explainable Artificial Intelligence; Predictive Model.

PROJETO CONCIL-IA: RESULTADOS FINAIS E INOVAÇÕES DIGITAIS PARA RESOLUÇÃO DE CONFLITOS

RESUMO: O artigo apresenta os resultados do Projeto Concil-IA, iniciativa interdisciplinar da Universidade Federal de Santa Catarina (UFSC) em parceria com o Juizado Especial Cível da instituição, voltada ao desenvolvimento de uma plataforma de Resolução Online de Disputas (ODR) baseada em Inteligência Artificial (IA) para conflitos consumeristas. A pesquisa consolidou suas contribuições em três frentes principais: modelagem preditiva, explicabilidade e validação da interface digital. Na modelagem preditiva, foi desenvolvido um modelo de regressão a partir de 1.851 sentenças anonimizadas relativas a litígios de transporte aéreo. Testaram-se diferentes técnicas de Aprendizado de Máquina (Decision Tree, Random Forest e AdaBoost), sendo selecionado o Decision Tree Regressor por equilibrar desempenho, interpretabilidade e eficiência computacional. O modelo obteve resultados satisfatórios, com erro médio absoluto de aproximadamente R$ 1.672 e raiz do erro quadrático médio de R$ 2.286, confirmando sua adequação para cenários reais de conciliação. Na frente da explicabilidade, aplicaram-se métodos de Inteligência Artificial Explicável (XAI) por meio do SHAP (SHapley Additive exPlanations). Esse recurso possibilitou a interpretação global do modelo e explicações locais em casos específicos, destacando como fatores mais relevantes para o arbitramento de indenizações o atraso ou cancelamento de voo e a ausência

de assistência pela companhia aérea. Por fim, o modelo foi incorporado a uma plataforma web responsiva (concilia.ufsc.br/app.concilia.ufsc.br), desenvolvida em WordPress e validada junto a conciliadores e servidores do JEC/UFSC. Os testes de usabilidade, realizados por meio de questionários, indicaram altos índices de aceitação, com médias entre 4,8 e 5,0 em critérios de clareza, organização, conforto e eficácia. Os resultados confirmam a viabilidade técnica e a relevância institucional do Concil-IA como uma inovação digital para a resolução de conflitos, em particular a conciliação judicial. Futuras etapas incluem a ampliação da base de dados, a expansão para outros ramos do Direito e a integração com políticas nacionais de Justiça digital.

PALAVRAS-CHAVE: Resolução Online de Disputas; Inteligência Artificial Explicável; Modelos Preditivos.

TABLE OF CONTENTS: Introduction; 1. Related Work; 2. Project Development Methodology; 2.1. Collection of Court Decisions on Moral Damage Compensation and Structuring of a Factor-Based Dataset; 2.2. Model Training and Testing; 2.2.1. Data Preparation; 2.2.2. Training and Testing; 2.2.3. Explainability; 2.3. Development of the Web Interface for Model Deployment; 2.4. Web Interface Validation; 3. Project Results; 3.1. Predictive and Explainable Regression Model; 3.2. Web Interface: Access and Usability; 3.3. User Feedback; Final Considerations and Future Work; References.

INTRODUCTION

The Brazilian Judiciary faces a scenario of growing litigiousness, as evidenced by the *Justiça em Números* report from the National Council of Justice (CNJ).[14] To address this situation, the CNJ has been consolidating two strategic agendas: (i) the promotion of self-compositional methods for conflict resolution, especially through conciliation and mediation, and (ii) the intensive adoption of digital technologies and Artificial Intelligence (AI)-based solutions. In this context, noteworthy initiatives include Resolution № 125/2010,[15] which established the National Judicial Policy for Adequate Treatment of Conflicts; Resolution № 332/2020,[16] which set ethical and governance parameters for the use of AI in the Judiciary; and the recent Resolution № 615/2025,[17] which defines guidelines for the development and governance of AI solutions in the judicial sphere.

14. Conselho Nacional de Justiça (CNJ), "*Justiça em Números 2024*" (report, Brasília, CNJ, 2024).
15. Conselho Nacional de Justiça (CNJ), "*Resolução n° 125 de 29 de Novembro de 2010*," published November 29, 2010, accessed October 18, 2024, https://atos.cnj.jus.br/atos/detalhar/156.
16. Conselho Nacional de Justiça (CNJ), "*Resolução n° 332 de 21 de Agosto de 2020*," published August 21, 2020, accessed October 18, 2024, https://atos.cnj.jus.br/atos/detalhar/3429.
17. Conselho Nacional de Justiça (CNJ), "*Resolução n° 615 de 24 de Abril de 2025*," published April 24, 2025, accessed May 10, 2025, https://atos.cnj.jus.br.

The Concil-IA Project emerges as a multidisciplinary response to these challenges. Developed by the Electronic Government, Digital Inclusion and Knowledge Society research group (EGOV/UFSC), in partnership with the UFSC Small Claims Court (*Juizado Especial Cível*), the project aims to create an Online Dispute Resolution (ODR) platform capable of assisting conciliators, parties, and attorneys in conducting hearings and formulating settlement proposals.

In its early stages, Concil-IA focused on collecting judicial decisions, extracting relevant factors, and structuring a dataset using language models such as GPT. Subsequently, it advanced to the development of predictive models capable of estimating compensation amounts for moral damages, incorporating Explainable Artificial Intelligence (XAI) techniques, especially the SHAP (SHapley Additive exPlanations) method, to ensure transparency and trust in the results. More recently, the project made these models available on a responsive digital platform, integrated into the conciliation flow of the UFSC Small Claims Court, and subjected to usability testing with judges, clerks, and conciliators.

This article presents the results of the Concil-IA Project, consolidating its contributions in three main dimensions: (i) the development of a predictive and explainable model for estimating moral damage compensation, (ii) the practical deployment of the solution through a secure and accessible web interface, and (iii) the institutional validation of the tool within the Judiciary. In addition to systematizing the project's findings, the study discusses the potential impacts of the initiative in building a more transparent, accessible, and digitally innovative Justice system.

1. RELATED WORK

AI and machine learning (ML) have been increasingly applied in legal contexts to predict judicial decisions, analyze contracts, and support conflict resolution. Despite their accuracy, challenges related to interpretability, transparency, and real-world deployment remain. The following review highlights key contributions

in predictive modeling, explainable AI, and digital tools for conflict resolution, providing the foundation for the Concil-IA Project.

In judicial environments, various predictive models have already been implemented in Supreme Courts. In the U.S. Supreme Court, Katz, Bommarito, and Blackman created a model to predict the Court's behavior on specific legal issues, using factors such as the year of the case, the matter under discussion,[18] and the Court's composition.[19] At the European Court of Human Rights (ECHR), Aletras et al. designed a model capable of predicting violations of civil and political rights, identifying that the "facts" section was the most relevant predictive factor.[20] Other examples include the Supreme Court of the Philippines,[21] with predictions in criminal cases, and the Supreme Court of India, which implemented the "eLeg-Predict" system to classify judicial appeals.[22]

In the extrajudicial field, tools have emerged for document and contract analysis. The Italian system CLAUDETTE identifies unfair clauses in Terms of Service;[23] in Germany, Glaser, Scepankova, and Matthes explored the portability of ML models across different legal systems;[24] and CUAD supports contract review by highlighting relevant clauses.[25] Although highly accurate, such systems do not clearly explain the reasoning behind predictions.

18. Daniel Martin Katz, Michael J. Bommarito, and Josh Blackman, "A General Approach for Predicting the Behavior of the Supreme Court of the United States," PloS One 12, no. 4 (2017): e0174698.
19. Daniel Martin Katz, Michael J. Bommarito, and Josh Blackman, "Predicting the Behavior of the Supreme Court of the United States: A General Approach," arXiv preprint arXiv:1407.6333 (2014).
20. Nikolaos Aletras, Dimitrios Tsarapatsanis, Daniel Preoțiuc-Pietro, and Vasileios Lampos, "Predicting Judicial Decisions of the European Court of Human Rights: A Natural Language Processing Perspective," PeerJ Computer Science 2 (2016): e93.
21. Michael Benedict L. Virtucio, Ma. Regina E. Estuar, and Stephanie G. Ching, "Predicting Decisions of the Philippine Supreme Court Using Natural Language Processing and Machine Learning," in 2018 42nd Annual Computer Software and Applications Conference (COMPSAC) (New York: IEEE, 2018), 2:130–35, https://ieeexplore.ieee.org/document/8377844.
22. Sugam K. Sharma, Ritu Shandilya, and Swadesh Sharma, "Predicting Indian Supreme Court Judgments, Decisions, or Appeals: eLegalls Court Decision Predictor (eLegPredict)," Statute Law Review (2022).
23. Marco Lippi et al., "CLAUDETTE: An Automated Detector of Potentially Unfair Clauses in Online Terms of Service," Artificial Intelligence and Law 27, no. 2 (2019): 117–39.
24. Ingo Glaser, Elena Scepankova, and Florian Matthes, "Classifying Semantic Types of Legal Sentences: Portability of Machine Learning Models," in Legal Knowledge and Information Systems (JURIX 2018), ed. Monica Palmirani (Amsterdam: IOS Press, 2018), 61–70.
25. Dan Hendrycks et al., "CUAD: An Expert-Annotated NLP Dataset for Legal Contract Review," arXiv preprint arXiv:2103.06268 (2021).

In Brazil, the VICTOR project, developed by the Federal Supreme Court, applies ML to identify cases related to general repercussions.[26] Other similar studies have applied AI to analyze consumer law appeals in the Rio de Janeiro Court of Justice,[27] to link new cases to repetitive appeals (IRDRs) in the Goiás Court of Justice,[28] and to organize notifications in the Rio de Janeiro Public Defender's Office.[29] In Santa Catarina, research in partnership with the UFSC Small Claims Court developed predictive models for air transport disputes, forecasting both consumer success and compensation amounts for moral damages.[30][31][32] Despite advances, these models faced practical challenges due to the lack of explanation for predictions, which generated resistance among users.[33]

This challenge has directed the literature toward the field of Explainable Artificial Intelligence (XAI), which seeks to make the criteria used by ML models traceable. Methods such as SHAP allow for assessing the importance of each factor in an algorithmic decision, fostering transparency and auditability.[34] More recent studies highlight the relevance of personalized explainability (PXAI), which

26. Nilton Correia da Silva et al., "Document Type Classification for Brazil's Supreme Court Using a Convolutional Neural Network," in Proceedings of the 10th International Conference on Forensic Computer Science and Cyber Law (ICOFCS) (São Paulo, 2018), 29–30, https://cic.unb.br/~teodecampos/ViP/correiaDaSilva_etal_icofcs2018.pdf.

27. William Paulo Ducca Fernandes et al., "Appellate Court Modifications Extraction for Portuguese," Artificial Intelligence and Law 28, no. 3 (2020): 327–60.

28. Antônio Pires Castro Júnior, Gabriel A. Wainer, and Wesley P. Calixto, "Application of Artificial Intelligence in the Automatic Identification and Classification Repetitive Demand Resolution Incident in the Brazilian Court of Justice," Revista da Faculdade de Direito da UFG 45, no. 2 (2021).

29. Marcus Parreiras et al., "Inteligência Artificial Aplicada para o Aumento da Produtividade no Atendimento de Intimações," in ANAIS do X Workshop de Computação Aplicada em Governo Eletrônico (SBC, 2022), 180–91.

30. Isabela Cristina Sabo et al., "*Classificação de Sentenças de Juizado Especial Cível Utilizando Aprendizado de Máquina*," Revista Democracia Digital e Governo Eletrônico 1, no. 18 (2019): 94–106.

31. Thiago Raulino Dal Pont et al., "Regression Applied to Legal Judgments to Predict Compensation for Immaterial Damage," PeerJ Computer Science 9 (March 23, 2023): e1225, https://doi.org/10.7717/peerj-cs.1225.

32. Thiago Raulino Dal Pont, "Representation, Classification and Regression Techniques Applied to Legal Judgments about Immaterial Damage due to Failures in Air Transport Services" (Master's thesis, Universidade Federal de Santa Catarina, 2021).

33. Isabela Cristina Sabo, "A Machine Learning-Based Model for Judgement Results Prediction and Support in Brazilian Special Court's Conciliation Hearings" (PhD diss., Universidade Federal de Santa Catarina, 2022).

34. Scott Lundberg and Su-In Lee, "A Unified Approach to Interpreting Model Predictions," arXiv.org, May 22, 2017, https://arxiv.org/abs/1705.07874.

adapts the level of detail of explanations to each user's profile, increasing trust and engagement.[35]

In parallel, the literature on Online Dispute Resolution (ODR) points out that digital solutions can expand access to justice and reduce the judiciary's overload.[36] Initiatives such as LLMediator,[37] which uses GPT-4 to support online negotiations, and explanatory conversational agents[38] demonstrate the potential of integrating prediction, communication, and explainability into conciliation platforms. Also noteworthy are the efforts of Bagga and Stathis to translate automated negotiation strategies into explanations understandable to non-expert users.[39]

Despite these advances, studies that jointly integrate three fundamental dimensions remain rare: (i) predictive model for calculating compensation amounts in consumer disputes, (ii) the application of explainability techniques to predictions, and (iii) the practical deployment in a web interface tested and validated by judges, conciliators, and parties. This gap is precisely the space occupied by the Concil-IA Project, which proposes a digital innovation for conflict resolution, combining academic research and institutional application within the Brazilian justice system.

35. Niklas Kühl et al., "Personalized Explainable AI (PXAI): Tailoring Explanations to User Needs," Decision Support Systems 172 (2024): 113859.
36. United Nations Commission on International Trade Law (UNCITRAL), Technical Notes on Online Dispute Resolution (New York: United Nations, 2017).
37. Henrik Westermann, Jaromír Savelka, and Karim Benyekhlef, "LLMediator: Large Language Models for Online Dispute Resolution," in Proceedings of the International Conference on Artificial Intelligence and Law (Braga: ACM, 2023).
38. Rasmus Feldhus, Abishek Ravichandran, and Sören Möller, "Explainable Conversational Agents: Designing Transparency for Human-AI Interaction," in Proceedings of the 4th Conference on Conversational User Interfaces (New York: ACM, 2022).
39. Prerna Bagga and Kostas Stathis, "Explainable Negotiation Agents: Towards Transparent Automated Bargaining," Autonomous Agents and Multi-Agent Systems 37, no. 3 (2023): 1–28.

1. PROJECT DEVELOPMENT METHODOLOGY

1.1 Collection of Court Decisions on Moral Damage Compensation and Structuring of a Factor-Based Dataset

The data used to develop our model consists of judicial decisions issued by the UFSC Small Claims Court (*Juizado Especial Cível* – JEC/UFSC).The Small Claims Court is considered an innovative body within the Brazilian legal system, due to the absence of court fees at the first instance and the possibility for parties to litigate without a lawyer in cases of up to twenty minimum wages. While this has facilitated access to justice, it has also attracted a large volume of claims. In 2023 alone, for example, 6,155,368 lawsuits were filed before Small Claims Courts nationwide.[40] In this sense, analyzing the decisions of the JEC/UFSC is essential to understand the main types of claims filed and how they are adjudicated.

The collection of documents was facilitated by the partnership between the research team and the judicial body. The keywords used in the search for decisions were "air transport" or "flight," covering the period from 02/08/2011 to 05/22/2024. The current project dataset is composed of 1,861 decisions, all concerning consumer law disputes, specifically failures in services provided by airlines.

Through expert legal analysis, we identified factors influencing the assessment of moral damages, i.e., the criteria considered in judicial rulings and the elements affecting the increase or reduction of compensation, as summarized in Table 1.

Table 1 – Factors identified by the expert

Factor	Objective
Judgment outcome (upheld/dismissed)	To verify whether the claim was granted or not.
Moral damage	To verify whether moral damage was recognized due to the incident suffered by the consumer.
Amount of moral damage	To verify the amount of compensation awarded by the court.

40. CNJ, "*Justiça em Números* 2024."

Right to regret and repayment claim	To verify the occurrence of withdrawal from purchase, which may be requested by the plaintiff within seven days when made online or by phone.
Breach of offer (Downgrade)	To verify whether the company failed to honor an offer made to the customer.
Baggage loss (permanent/temporary)	To verify baggage loss. Permanent loss means the baggage is never recovered; temporary loss means it is misplaced for a period.
Loss interval	To verify how long the baggage remained lost.
Flight delay	To verify whether the plaintiff reached their final destination and if this occurred after a delay.
Delay interval	To verify the total delay in arrival compared to the scheduled arrival time indicated at purchase.
Flight cancellation	To verify whether the consumer failed to reach the final destination.
Tampered baggage	To verify the occurrence of violation, theft, or damage to baggage.
Consumer fault	To verify when the incident occurred due to the consumer's exclusive fault (e.g., late arrival at boarding), exempting the company from liability.
Adverse weather conditions	To verify when the trip was prevented due to unfavorable weather.
No show	To verify when the consumer failed to appear for boarding without prior notice.
Overbooking	To verify when more tickets were sold than the aircraft could accommodate.
Failure of airline assistance	To verify when the airline provided assistance (meals/hotel/alternative transportation).
Consumer hyper-vulnerability	To verify when the consumer is elderly, pregnant, disabled, taking medication, or accompanied by children under 12 years old.

Source: Authors

The identified factors aim to reflect the impact of the consumer's harm in the judicial decision. For example, when moral damages are recognized, certain factors tend to aggravate the ruling, such as the length of delay in reaching the

desired destination, which can vary considerably. In the project's dataset, delays range from 4 to 72 hours, which directly affects the compensation awarded.

It is important to note that, in the selected sample, some factors are expressly emphasized by judges in their reasoning. That is, they explicitly state that certain elements were considered when assessing moral damages. For instance, the absence of adequate assistance to the consumer, or assistance provided in an unsatisfactory manner. Another example is the understanding that delays of less than four hours are deemed mere inconveniences, which generally lead to the dismissal of claims for moral damages.

To systematize this information, a legal expert manually extracted the relevant factors from each decision, recording them as 'S' when the factor was present, 'N' when absent, and '-' when undefined; numerical factors were also recorded whenever applicable. In addition to this manual procedure, automatic extraction was implemented to enable scalability in data collection. To achieve this, a Large Language Model (Generative Pre-trained Transformer, OpenAI Chat-GPT) was prompted to read anonymized sentences and identify whether one of the factors highlighted by the experts was or not among the reasons by the judge on the moral damage compensation. The amount of entries of each type of extraction is indicated in Table 2.

Table 2 – Proportions of entries by extraction modality

Extraction Mode	**Number of Entries**
Manual	1174
Automatic	687

Source: Authors

The full methodology that guided the use of LLM to factor extraction are detailed in a previous project work.[41]

41. Lucas De Castro Rodrigues Pereira et al., "Using GPT-4o as a Factor Extractor for Brazilian Consumer Law Judgments" Artificial Intelligence and Law, August 12, 2025, https://doi.org/10.1007/s10506-025-09466-6.

1.2 Model Training and Testing

After structuring the dataset, it was filtered and pre-processed to train multiple models with varying parameters. These models were then evaluated against a subset of the dataset, and the best-performing model and parameter set were selected.

1.2.1 Data Preparation

The first step in data preparation involved standardizing the different formats found in the dataset. Categorical markers such as letters ('S' for yes, 'N' for no, and '-' for undefined) and time expressions for interval factors were converted into integers ('1' when the factor was present in the case, '0' when absent). In addition, the factors "Loss interval" and "Delay interval" were grouped into numbered ranges, as shown in Tables 3 and 4. These ranges were defined based on the frequency distribution of time gaps observed in the dataset.

Table 3 – Ranges used in the Temporary Luggage Loss Interval Factor.

Range	Interval (Hours)	Frequency Found in the (manual) Database
0	0	86,59 %
1	1 - 24	3,06 %
2	25 - 72	4,57 %
3	73 - 168	3,23 %
4	>= 169	2,55 %

Source: Authors

Table 4 – Ranges used in the Flight Delay Factor.

Faixa	Interval (HH:MM)	Frequency Found in the (manual) Database
-1	Consumer didn't arrive at the destination	14,52 %
0	0	50,25 %
1	0:01 - 3:59	2,38 %

2	4:00 - 7:59:00	10,70 %
3	8:00 - 11:59	10,78 %
4	12:00 - 15:59	7,56 %
5	16:00 - 23:59	6,03 %
6	24:00 - 27:59	8,74 %
7	>= 28:00	3,56 %

Source: Authors

In particular, the "Flight cancellation" factor was merged with "Flight delay", being represented by the range -1. Additionally, the "Failure of airline assistance" factor was inverted (0's converted to 1's and vice versa) so that it could be interpreted as lack of airline assistance, thereby avoiding the representation of a negative factor.

Then, the data was filtered at both the row (data cases) and column (factors) levels. Rows were removed based on the identification of outliers (rare values, inconsistent with the majority) using the quartile method. The criteria for removing columns included redundancy of information (such as the binary factors for "Flight delay" and "Temporary baggage loss", whose information is already represented in the ranged values) and the observed impact on model accuracy.

The factors "Consumer fault" and "Adverse weather conditions" were excluded because they nullify the value of moral damage compensation and are therefore likely to cause significant confusion for the model. Instead, these factors were incorporated as screening questions in the Web Interface, where users are informed that, if any of these events occurred, they are unlikely to receive any moral damage compensation.

Afterwards, the remaining data was balanced by creating 14 moral damage compensation ranges and replicating example cases within each range until all 14 ranges were of equal size.

1.2.2 Training and Testing

Once the dataset was prepared, we proceeded to the supervised learning stage. Supervised learning involves inferring a function (finding a correlation) from labeled training data and using it to predict outcomes for new, unseen data. Since our goal is to estimate the value of moral damage compensation based on a set of input factors, we employed regression, a type of supervised learning designed to predict numerical values rather than categories, making it well-suited for this task.[42]

The dataset was stratified and divided into a training set, comprising 80% of the data, and a test set, comprising the remaining 20%. The training set is used to "teach" the model the relationships between factors and outcomes, while the test set evaluates the model's performance on data it has not seen before, simulating real-world predictions.

Three regression algorithms were tested: Decision Tree, Random Forest (an ensemble of Decision Trees), and AdaBoost (an ensemble of Random Forests).

Hyperparameters, such as the maximum depth of the trees, were adjusted using a heuristic approach (modifying one parameter at a time), rather than performing an exhaustive search, due to computational limitations.

The main metric used to guide model training was the Root Mean Squared Error (RMSE), which penalizes large errors more heavily, aligning with the project's priority of avoiding excessively large mispredictions. The Mean Absolute Error (MAE) was also recorded to provide users with a practical margin of error.[43]

The results of these metrics are presented in Section 3.1.

42. Vijay Kotu and Bala Deshpande, Data Science: Concepts and Practice, 2nd ed. (Cambridge, MA: Morgan Kaufmann, 2019).

43. Timothy O. Hodson, "Root-mean-square Error (RMSE) or Mean Absolute Error (MAE): When to Use Them or Not," Geoscientific Model Development 15, no. 14 (July 19, 2022): 5481–87, https://doi.org/10.5194/gmd-15-5481-2022.

1.2.3 Explainability

To enhance the explanation, interpretation, and justification of the model's predictions, we applied SHAP (SHapley Additive exPlanations). Using the Explainer method, we computed the contribution of each factor to the prediction, grounded in cooperative game theory.[44]

The results are visualized through waterfall charts and bar plots, which are presented in Section 3.1.

1.3 Development of the Web Interface for Model Deployment

The practical deployment of the predictive model required building a responsive web interface aimed at conciliators, judges, lawyers, and parties. This stage was carried out collaboratively by researchers from the fields of Law and Computer Science, with a focus on accessibility, clarity, and usability.

The system was developed in WordPress, hosted on the infrastructure of the Superintendence of Electronic Governance and Information and Communication Technology - SeTIC/UFSC (*Superintendência de Governança Eletrônica e Tecnologia da Informação e Comunicação*), and is accessible at concilia.ufsc.br and app.concilia.ufsc.br. The adoption of this architecture ensured greater stability, scalability, and ease of maintenance. In addition, digital security mechanisms were implemented, such as SSL certificates, reCAPTCHA authentication, and protection against Cross-Site Request Forgery (CSRF), ensuring compliance with good data governance practices.

The interface was designed to be intuitive and functional, structured into three main sections:

» Homepage – Presents information about the Concil-IA project, its motivation, and basic usage instructions.

» Airline Liability Verification Form – Allows users to enter essential case information, corresponding to the factors extracted in Table 1 (Flight de-

44. Lundberg and Lee, "A Unified Approach to Interpreting Model Predictions."

lay, Baggage loss, Failure of airline assistance, etc.), which feeds into the predictive model.

» Consultation Tool (Concil-IA App) – Displays the estimated compensation amount, along with visual explanations generated by the SHAP method, highlighting the most relevant factors in the prediction. It also includes a "skip step" option, enabling conciliators to go directly to the result, streamlining hearing procedures.

During development, prototyping cycles were carried out in Figma, followed by adjustments based on feedback from legal experts. The system was designed to be cross-platform, ensuring compatibility with computers, tablets, and smartphones, thereby broadening its accessibility in digital conciliation environments.

Finally, the interface incorporated traceability elements (such as access and usage logs), enabling auditing and monitoring of the tool, in line with the principles of algorithmic accountability and transparency required by the National Council of Justice.

The full web interface is presented in Section 3.2.

1.4 Web Interface Validation

The testing phase took place in a controlled environment, aiming to verify the stability and performance of the platform, as well as to collect impressions from conciliators and researchers regarding usability, clarity, and the usefulness of the suggestions. After the development of the classification model and the web interface was completed, a questionnaire was prepared for the team of the Civil Small Claims Court Office at UFSC, focusing on the evaluation of navigability, clarity of instructions, and the tool's compatibility with the court's workflow.

The link to access the form is available at the bottom of the page app.concilia.ufsc.br, in the section "Evaluate our tool here". The questionnaire was structured with the following questions:

1. On a scale from 0 to 5, how would you rate the Airline Liability Verification Form (prior to the Concil-IA App)?

2. On a scale from 0 to 5, how clear did you find the presented query in the Concil-IA App?
3. On a scale from 0 to 5, how would you rate the organization of the questions in the Concil-IA App?
4. On a scale from 0 to 5, do you believe that the response format provided by the Concil-IA App will be effective when applied in a real conciliation hearing?
5. On a scale from 0 to 5, as a conciliator, would you feel comfortable using the Concil-IA App in your work?
6. Was there any question that caused doubts or confusion? If so, which one? (multiple choice among: right to regret and repayment claim; breach of offer; permanent or temporary baggage loss; tampered baggage; hyper-vulnerability; flight delay, cancellation, or change; no-show; overbooking; airline's failure to provide assistance; none)
7. Suggestions, criticisms, or compliments (open field).
8. On a scale from 0 to 5, rate your overall experience using the Concil-IA App.

The responses were recorded anonymously and integrated into Google Forms, allowing the generation of real-time reports and the identification of strengths and improvement opportunities. At this stage, the predictions generated by the AI model were not applied to conciliation decisions, with the analysis focused instead on the user experience of the interface and the collected feedback.

Finally, the validation process also complied fully with the requirements of Brazilian ethical legislation. The questionnaire did not collect personal or sensitive data and was only applied with free and informed consent. Furthermore, the responses, recorded anonymously, ensured confidentiality and privacy, fully respecting the principles of autonomy and participant protection, without imposing any additional risks.

The user responses are organized and discussed in Section 3.3.

2. PROJECT RESULTS

2.1 Predictive and Explainable Regression Model

After testing three regression algorithms (Decision Tree, Random Forest, and AdaBoost), the Decision Tree Regressor was selected for its balance of technical performance and interpretability, an important consideration in the legal field, where predictions must be accompanied by clear and understandable justifications. The model's performance was evaluated using standard regression metrics, and the results from these evaluation metrics indicated the effectiveness and reliability of the selected model.

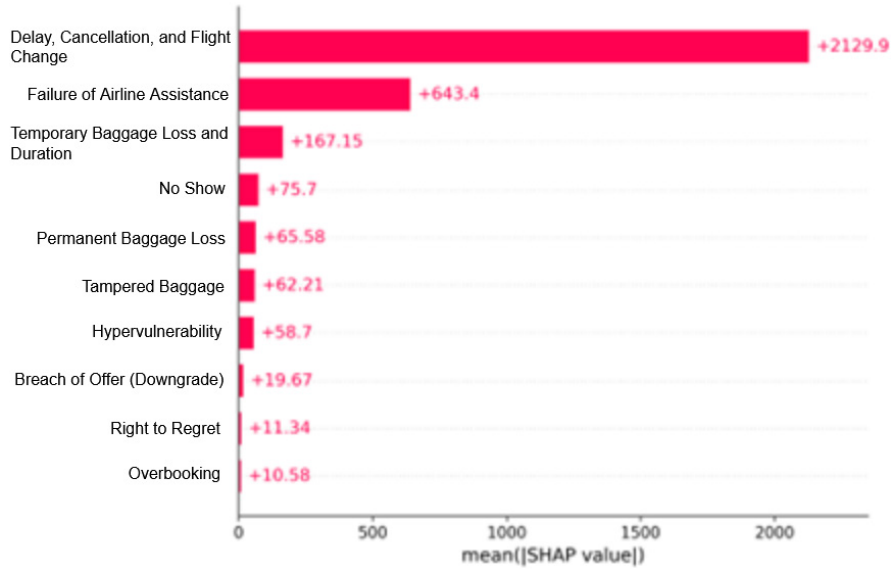
» Mean Absolute Error (MAE): 1,672.30
» Root Mean Squared Error (RMSE): 2,285.85

After applying the SHAP method, we identify which factors most influence the model's results, both at a global level (the factors most relevant on average across all cases) and at a local level (the justification for each individual prediction). The results indicated that the most decisive factors for compensation amounts were:

» Flight delay duration;
» Provision or lack of assistance by the airline;
» Flight cancellation;
» Baggage loss.

The bar plot chart (Figure 1) shows the positive impact of each factor on the average model's estimates of moral damage compensation.

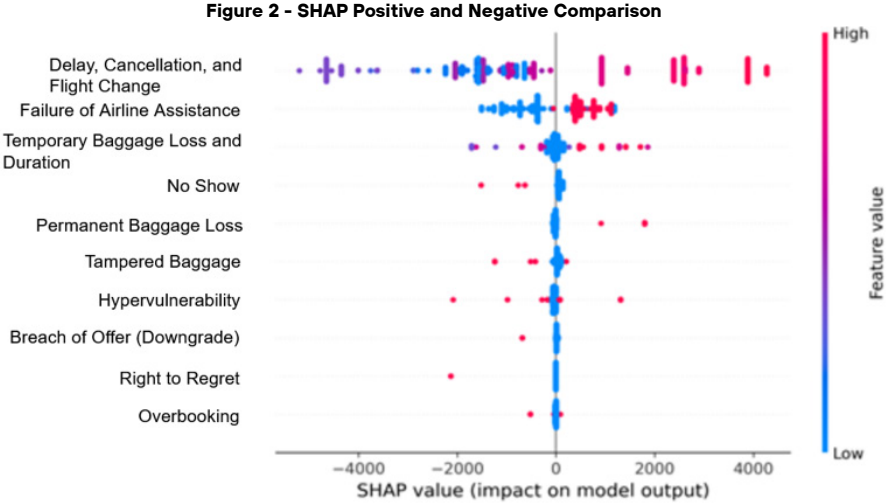
Figure 1 - SHAP Positive Impact on Moral Damage Compensation



Source: Authors

The beeswarm chart (Figure 2) also shows the negative impact a factor can have on the global amount estimated. It's needed because, since some of the factors are rare in the database, their global impact is reduced, even if they greatly impact the result when present.

Figure 2 - SHAP Positive and Negative Comparison

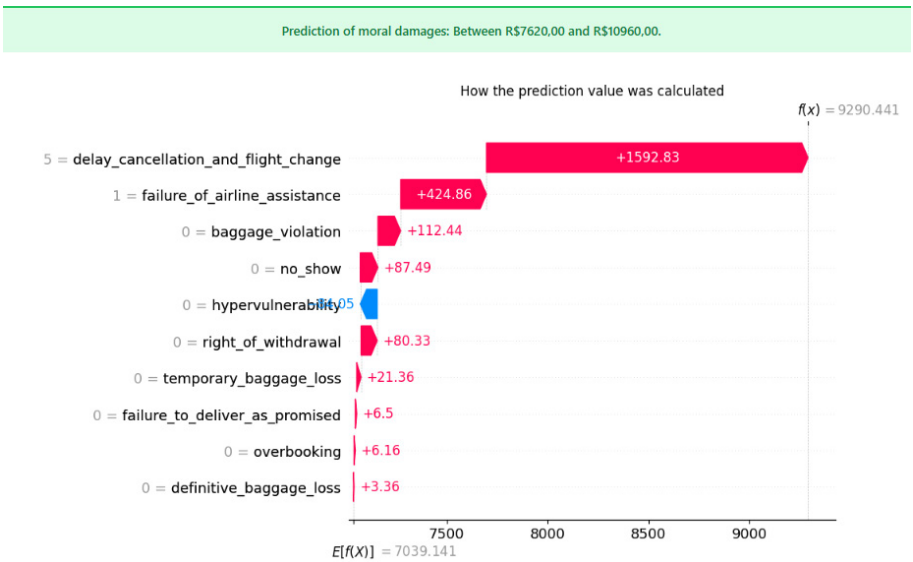


Source: Authors

With the support of beeswarm plots, conciliators and users can clearly visualize how each factor impacted the outcome. This layer of explainability is essential to reducing distrust regarding the use of AI in the legal field, as it reveals not only the prediction but also the reasoning behind it.

Users also receive an individualized waterfall chart for each case analyzed. In Figure 3, one example is shown to illustrate the contribution of the input factors. In this specific case, the results indicate that the factors "Flight delay" and the lack of "Failure of airline assistance" were the most relevant factors influencing the predicted outcome.

Figure 3 - SHAP Case Example Output



Source: Authors

2.2 Web Interface: Access and Usability

The Concil-IA homepage (https://concilia.ufsc.br/) was designed to provide simple and objective navigation, allowing conciliators and parties to quickly access the main features. The homepage (Figure 4) highlights the experimental nature of the platform, featuring two central buttons: "I Want to Conciliate," which

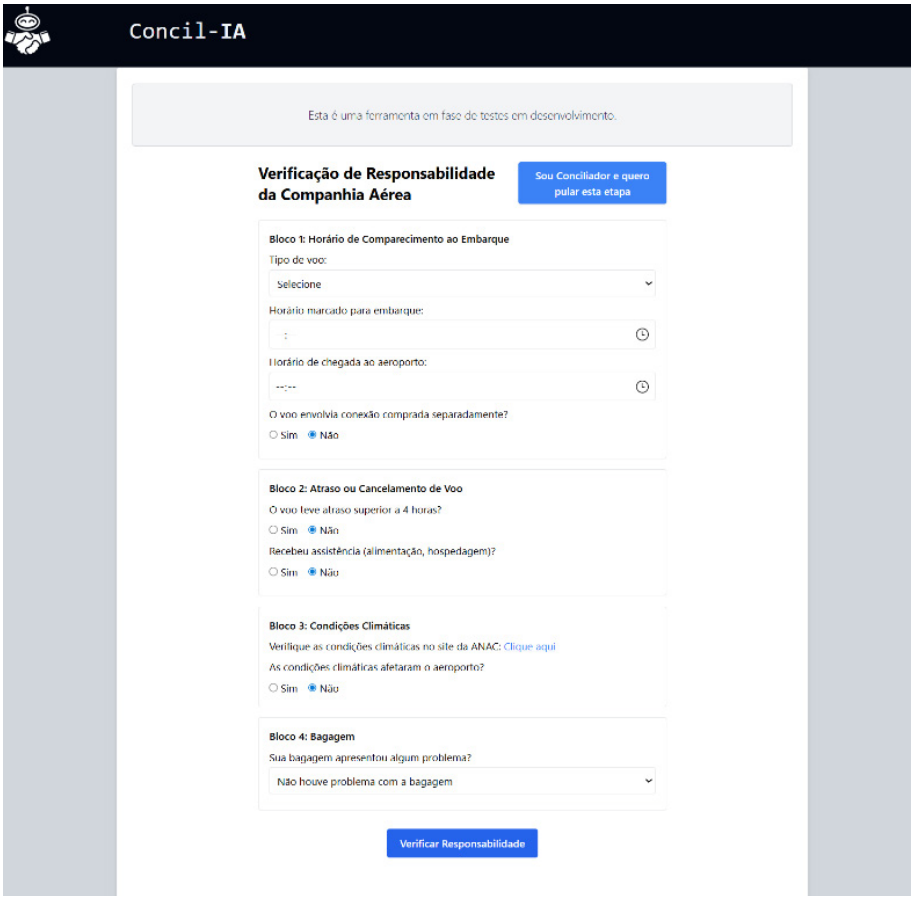
directs users to the responsibility verification interface, and "Project Publications", which gathers articles and reports produced by the team.

Figure 4 – Initial Interface of the Concil-IA Project

Source: Concil-IA (2025)

By selecting "I Want to Conciliate," the user is redirected to the Airline Liability Verification Form (https://app.concilia.ufsc.br/) (Figure 5). In this form, the information is organized into four logical blocks — boarding, delay or cancellation, weather conditions, and baggage — allowing the registration of essential case data.

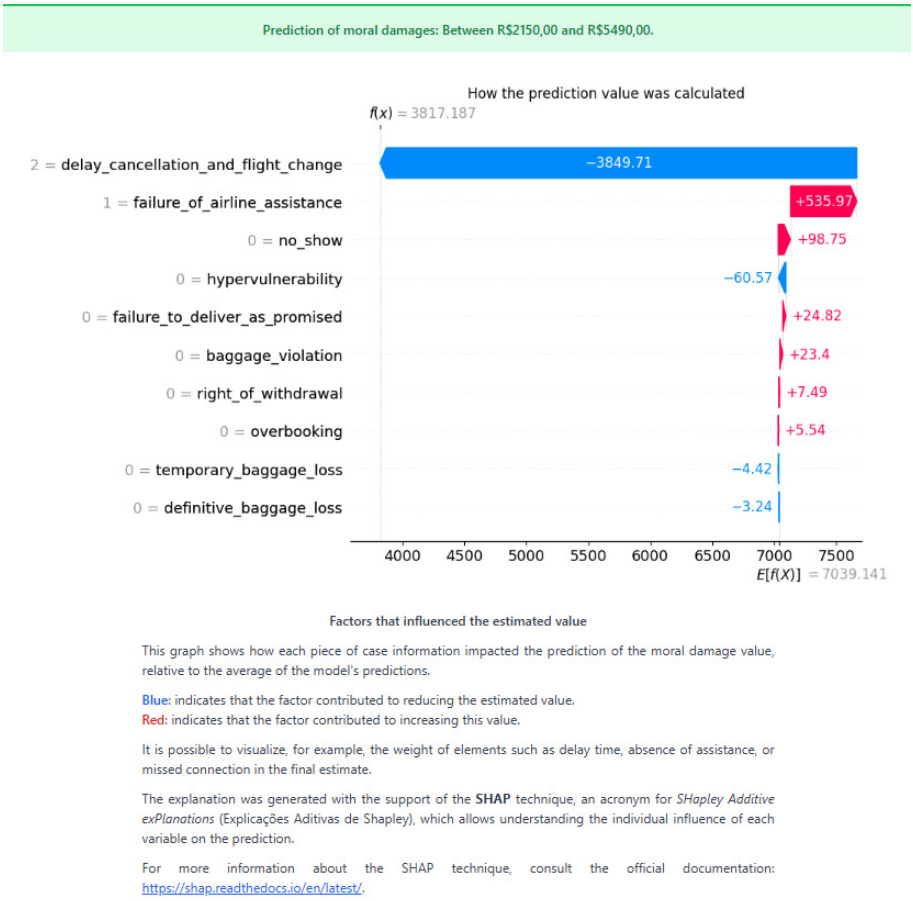
Figure 5 – Interface of the Airline Liability Verification Form



Source: Concil-IA (2025)

Only if the potential for airline liability is confirmed is the user directed to the Consultation Tool (Concil-IA App), where they respond to structured questions corresponding to the manually and automatically extracted factors. After submission, the platform immediately generates an estimated compensation result, accompanied by an explanatory SHAP-based graph (Figure 6). This feature makes explicit how each factor considered by the model (such as delay time, failure of airline assistance or baggage issues) contributes to the final calculation, providing greater transparency to the conciliation process.

Figure 6 – Graph Result of the Query in the Concil-IA App



Source: Concil-IA (2025)

Thus, the Concil-IA digital interface combines practicality and substantiation, enabling parties and conciliators to access clear, structured, and transparent information in support of conflict resolution.

2.3 User Feedback

The validation stage was carried out in partnership with the UFSC Small Claims Court, involving the presiding judge, the clerks from the judge's chambers, and other members of society, totaling eight participants. The objective,

through the questionnaire described in Section 2.4, was to evaluate the usability, clarity, and practical applicability of the Concil-IA digital platform in a testing environment.

The responses obtained were highly positive, with average scores ranging between 4.50 and 4.88 on a 0-to-5 scale, which demonstrates the strong acceptance of the Concil-IA App by its users:

» Questionnaire clarity: 4.75;
» Organization of questions: 4.50;
» Ease and comfort of use for conciliators: 4.75;
» Expected effectiveness in real hearings: 4.75;
» Overall experience rating: 4.88.

In addition to the quantitative results, the qualitative feedback reinforced the institutional acceptance of the tool. Users highlighted the clarity, objectivity, and practical usefulness of the interface in guiding negotiations. Only one specific point, related to the questions on delays, cancellations, and rescheduling, generated doubts for 25% of respondents, which reveals a punctual opportunity for improvement.

The suggestions for enhancement focused mainly on the inclusion of additional factors, aiming to broaden the range of covered cases and make the tool more comprehensive and effective.

This preliminary validation confirms that the platform is both technically ready and institutionally accepted for use in real conciliation hearings.

FINAL CONSIDERATIONS AND FUTURE WORK

Technological advancement requires the legal field to constantly adapt, especially regarding the use of AI tools aimed at modernizing and improving the efficiency of the justice system. In this context, the Concil-IA Project, developed at the Federal University of Santa Catarina in partnership with the institution's Small Claims Court, represents an innovative initiative by integrating legal and

technological knowledge to enhance the resolution of consumer conflicts. The results obtained demonstrate the consolidation of a methodology capable of combining automated extraction of legal factors, explainable predictive modeling, and practical application in a web environment validated by justice system operators.

The predictive modeling stage revealed that the Decision Tree Regressor, complemented by explainability techniques through SHAP, was able to provide estimates close to those judicially awarded, within acceptable margins of error for application in conciliation hearings. This explainability, by clearly indicating which factors were decisive in the predictions, contributed to the transparency of the process and to building user trust.

Making the solution available on a responsive digital platform consolidated the project as a tool applicable to the daily practice of conciliation. Validated by a judge and clerks of the UFSC Small Claims Court, the tool achieved near-unanimous acceptance, especially regarding clarity, organization, and usability, reinforcing its technical and institutional viability. These findings confirm Concil-IA's potential as a mechanism to support negotiations between parties, capable of increasing predictability in hearings, reducing litigation, and strengthening the culture of self-composition.

Nevertheless, challenges remain that guide the next steps of the research. Among them are the need to expand the dataset, to experiment with more sophisticated regression algorithms, to conduct validations in real judicial conciliation hearings, and to extend the solution to other areas of law, such as telecommunications, health plans, and tenancy.

By combining technological innovation, interdisciplinary research, and practical application, Concil-IA positions itself as a reference in digital solutions for online dispute resolution, aligning with the guidelines of the National Council of Justice for the ethical and transparent use of artificial intelligence, and contributing in the long term to the construction of a more agile, transparent, and accessible justice system.

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Received on...

Approved on...