AI-Powered System for Simplifying and Analyzing Terms and Conditions

Nchimunya Kabalo
Mulungushi University
Kabwe,Zambia
nzkabalo@gmail.com
Brian Halubanza
Mulungushi University
Kabwe,Zambia
bhalubanza@gmail.com
Selina Halubanza
Kwame Nkrumah University
Kabwe,Zambia
selina.halubanza@gmail.com
Mainess Namuchile
Mulungushi University
Kabwe,Zambia
mainessnamuchile4@gmail.com
Michael Bwalya
Mulungushi University
Kabwe,Zambia
Zilani Kaluba
Mulungushi University
Kabwe,Zambia
zilanikaluba@gmail.com
Emmanuel Nyirenda
Mulungushi University
Kabwe,Zambia
enyirenda37@gmail.com

Abstract
Terms and Conditions (Ts&Cs) are foundational legal documents governing digital interactions between users and service providers. Despite containing critical information related to user rights, data privacy, and liability, these documents remain largely inaccessible due to their legal complexity and verbosity. This paper presents an AI-driven mobile application that leverages advanced Natural Language Processing (NLP) and Large Language Models (LLMs), particularly GPT-based architectures, to automate the simplification and risk analysis of Ts&Cs. The system provides end-users with concise summaries, risk flags, and contextual indicators for informed consent. The mobile application supports multiple input modalities, including document uploads, web URL parsing, and app-based term extraction. Evaluation was conducted using ROUGE and BERTScore metrics, achieving high fidelity in semantic summarization. Usability testing demonstrated that the system improves comprehension, fosters transparency, and reduces the time required for users to interpret legal documents. This work contributes to the broader discourse on algorithmic transparency, digital fairness, and ethical AI deployment in consumer protection. Experimental results indicate significant potential for scaling such tools across diverse jurisdictions and languages.

Keywords
Artificial Intelligence; Natural Language Processing; Terms and Conditions; Legal Summarization; Consumer Protection; GPT-4; LLMs; Usability Evaluation

Introduction

Terms and Conditions (Ts&Cs), often referred to as Terms of Service (ToS), End-User License Agreements (EULAs), or Service-Level Agreements (SLAs), serve as legally binding contracts between service providers and users. These documents define rights, responsibilities, and restrictions associated with digital services, including critical stipulations on data usage, privacy policies, dispute resolution, and liability limitations. However, despite their legal significance, Ts&Cs remain largely unread and misunderstood by most users due to their complex structure and heavy legal jargon [1], [2]. This reflects similar challenges faced in understanding critical public information such as early warning systems for locust outbreaks and health technologies in Zambia [31], [35], [38].

Empirical studies reveal that over 90% of users consent to Ts&Cs without reading them [3], primarily due to information overload, time constraints, and cognitive fatigue. McDonald and Cranor [4] estimated that reading every privacy policy encountered in a year would require 76 full working days. This widespread neglect, often referred to as the "biggest lie on the Internet," creates asymmetric power dynamic favoring service providers while exposing users to potential privacy breaches and unfavorable contractual obligations [5], [6].

The increasing ubiquity of online platforms exacerbates this issue, making it imperative to develop automated tools that empower users to comprehend digital contracts effectively. Recent advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP) particularly through the use of transformer-based Large Language Models (LLMs) such as BERT, T5, and GPT offer promising avenues for tackling this challenge [7], [8], [9].

In this work, we introduce an AI-powered mobile application designed to simplify, summarize, and analyze Ts & Cs documents using NLP and machine learning techniques. The application is tailored for general users and integrates risk detection modules to flag potentially harmful clauses. It provides input flexibility (via uploaded files, URLs, and installed app scanning), generates readable summaries, and identifies critical clauses that may affect user rights.

The primary objectives of this study are as follows:

Design and develop a user-centric mobile application that accepts multiple formats of Ts&Cs input.

Integrate state-of-the-art AI models to generate concise legal summaries and risk annotations.

 ISBN: 978-9982-95-500-3

Evaluate the performance of the system through both quantitative metrics and qualitative user feedback.

The remainder of this paper is organized as follows: Section III discusses related work and current approaches in legal document summarization. Section IV details the proposed system architecture and methodology. Section V presents evaluation results using benchmark NLP metrics and user testing. Section VI concludes with future research directions.

Digital contracts increasingly encode rights and responsibilities through dense legalese. Drawing parallels to public health risk exposure systems [26], [27], the need for AI-driven analysis of these documents is not only a usability concern but a digital equity imperative.

Related Work

The challenges surrounding the readability and complexity of Terms and Conditions (Ts&Cs) have long been a concern in digital legal studies. Foundational research has shown that most users neither read nor fully comprehend Ts&Cs before agreeing to them. Obar and Oeldorf-Hirsch [1] found that more than 90% of participants accepted terms without reading, highlighting the widespread nature of uninformed consent. Similarly, McDonald and Cranor [2] estimated that it would take the average user over 75 days per year to read the privacy policies encountered online. These findings illustrate a persistent gap between legal communication and user comprehension.

Legal scholars and technologists alike have emphasized that Ts&Cs often include critical clauses related to data privacy, content rights, arbitration agreements, and liability limitations [3]. Yet, these elements are typically buried in dense legal text, making them inaccessible to the average user. Courts generally uphold these agreements even if they go unread, as long as users have the opportunity to review them, a legal standard known as "notice and assent" [4].

The ethical dimensions of digital consent have also drawn increasing scrutiny. Solove [5] and Nissenbaum [6] argue that consent is often coerced or illusory when users are presented with no reasonable alternative to accepting invasive or one-sided terms. This problem is further compounded by the rise of big data and surveillance capitalism, where legal documents are weaponized to legitimize mass data collection without true user understanding.

To address these concerns, several systems have emerged. The non-profit initiative *Terms of Service; Didn't Read (ToS;DR)* attempts to manually summarize Ts&Cs into user-friendly labels [7]. Complementary research in accessible AI systems, including IoT for waste management [32], mobile face recognition [33], and gesture- controlled automation for users with disabilities

[34] shows the growing emphasis on user-focused digital tools. However, the platform's limited scalability and manual nature prevent it from providing real-time, personalized analysis. Commercial tools such as *LawGeex* use AI to review contracts, but these are tailored for enterprise legal departments and not for end-users [8].

Recent advances in AI and NLP have opened new possibilities for automating the summarization of legal text. Patil et al. [9] proposed an NLP pipeline utilizing Large Language Models (LLMs) such as BERT and GPT for regulatory document summarization. Similarly, Löffler et al. [10] applied NLP techniques to identify abusive clauses in Chilean Ts&Cs, achieving high accuracy in risk detection using GPT-4o.

Several works have also focused on the integration of LLMs in European and Indian legal systems. Prabhakar and Pati [11] demonstrated extractive summarization of Indian court judgments using T5 and GPT-2. Meanwhile, Żyłka et al. [12] explored the implications of GPT models for EU data privacy, emphasizing the need for legally aligned AI summaries that preserve contextual integrity.

A comparative study by Waidelich et al. [13] showed how LLMs could aid consumer protection by detecting illegal contractual clauses in Germany. Their findings echo Piscaglia's [14] earlier research, which tested GPT-2-based summarization of legal case reports and showed promising syntactic and semantic fidelity.

Despite this progress, there remains a lack of mobile-first systems that incorporate real-time, personalized clause risk detection for consumers. Our work fills this gap by introducing a mobile application powered by GPT-based models that not only summarizes Ts&Cs, but also flags potentially risky clauses across diverse input methods.

 ISBN: 978-9982-95-500-3

Table I — Comparison of Existing Tools

System	Target Audience	Capabilitie s	Limitati ons
ToS;DR [7]	General Users	Manual simplificati on and grading	Manual updates, limited document coverage
LawGee x [8]	Legal Profession als	AI-powered contract analysis	Enterpris e- focused, not usable by consumer s
GPT-2 (Piscagl ia) [14]	Academic	Summarizat ion of legal reports using DL	Focused on case law, not Ts&Cs
Our Propose d App	General Users	Real-time Ts&Cs summarizat ion and risk flagging	Mobile-first, supports multiple input types

Most research has focused on high-resource legal contexts, while successful deployments of AI in Zambian SMEs demonstrate potential for AI to empower users in contract interpretation [28].

Methodology and System Design

Development Approach

The system was developed using an **Agile Kanban** methodology to facilitate incremental development and iterative testing. This allowed for continuous integration of user feedback and adjustments in the design lifecycle. The application was designed for the Android platform, utilizing Android Studio (Java/XML) for front-end development and Python for backend NLP tasks.

System Architecture Overview

The architecture is modular and comprises the following core components:

Document Ingestion Module
AI-Powered Summarization and Clause Analysis Engine
Risk Classification and Flagging
User Interface and Visualization Layer
Secure Local Storage and Feedback Loop

Each module is independently testable and interacts through API-based communication. This modularity aligns with cloud-based AI infrastructures adopted in early warning systems
[31] and property valuation analysis models [36].

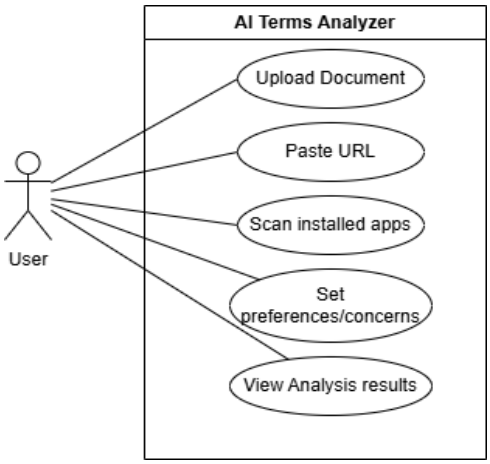

Fig. 1. Use Case Diagram

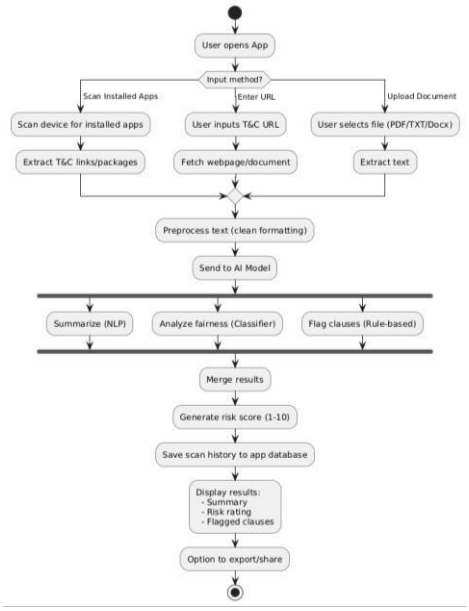

Fig. 2. Activity Diagram

 ISBN: 978-9982-95-500-3

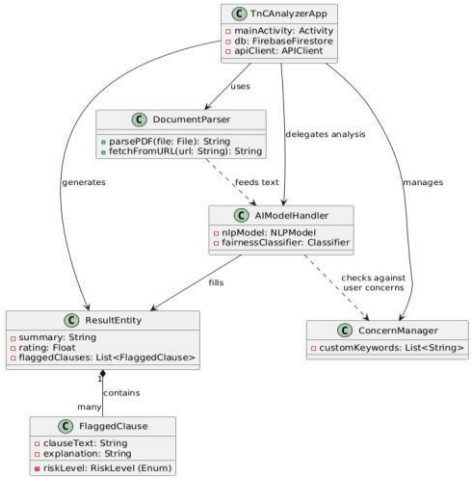

Fig. 3. Class Diagram

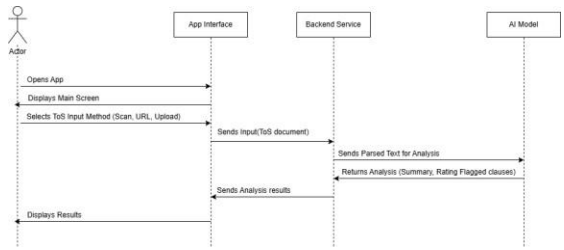

Fig. 4. Sequence Diagram

These illustrate the detailed system flow.

Input Modalities

The application supports three input methods for acquiring Ts&Cs:

Document Upload: Users can upload PDF or text-based documents from local storage.

URL Scraper: The system retrieves legal text from provided web links using Jsoup.

App Scan Parser: Automatically detects installed apps and extracts the associated terms via linked URLs or embedded files.

This tri-modal approach ensures flexibility and increases the tool's usability across different contexts.

NLP and AI Integration

The core AI functionality is built around GPT-4o, a state-of-the-art Large Language Model optimized for summarization and clause classification. The system leverages Spark NLP, NLTK, and Hugging Face Transformers for preprocessing, tokenization, and semantic embedding.

Key tasks performed:

TABLE I. Abstractive summarization: Using GPT-4o to produce semantically coherent summaries of Ts&Cs.

TABLE II. Risk clause detection: Identifying phrases such as "arbitration waiver", "data sharing without consent", or "unilateral termination rights" using attention-based classification.

TABLE III. Clause flagging and rating: Based on the presence of legally contentious or privacy- invasive terms.

The summarization model was fine-tuned with a custom dataset composed of publicly available ToS examples and annotations derived from ToS;DR [1], LegalBench [2], and manually tagged legal corpora.

Security and Data Handling

To ensure privacy and compliance with data protection best practices:

TABLE IV. Room Database is used for secure local data storage.

TABLE V. All sensitive data is encrypted using AES- 256 at rest.

TABLE VI. The application operates under data minimization principles, retaining only essential information required for processing.

Evaluation Metrics

To benchmark the summarization and analysis capabilities, the following NLP evaluation metrics were used:

- ROUGE-1, ROUGE-2, ROUGE-L: Measure the lexical overlap between the generated and reference summaries.
- BERTScore (F1): Measures semantic similarity using contextualized embeddings.

These metrics have become standard in evaluating summarization tasks in both general-purpose and legal NLP domains [3], [4].

The system used Android front-end and Python- based backend for NLP and summarization. Inspired by architectures proposed for regional

 ISBN: 978-9982-95-500-3

cloud integration among NRENs [29], our design ensures flexibility and scalability for low- bandwidth environments.

To prevent manipulation and unauthorized modification of summaries, we introduce clause verification logic informed by previous applications of AI in multifactor authentication [30].

Results and Evaluation

C. System Implementation

The mobile application was successfully deployed on Android and tested across multiple devices. As shown in **Figures 5 to 7**, the interface supports the three primary input modalities:

a. **Figure 5:** Demonstrates document acquisition via app scanning, URL entry, or file upload.

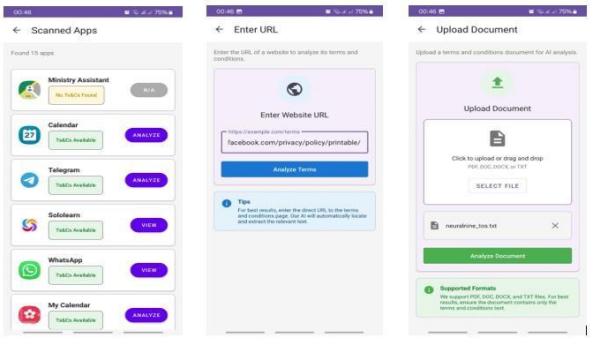

Fig 5. File Unploads

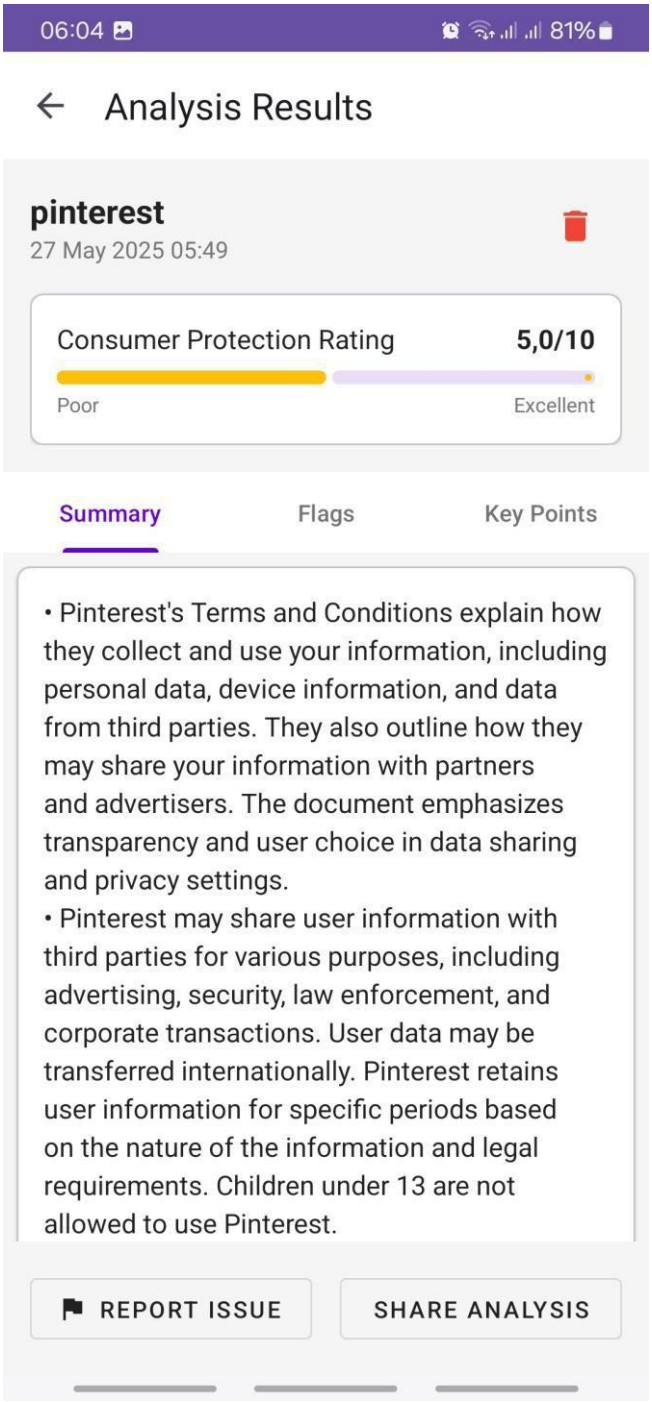

Fig. 6. Analysis

b. **Figure 7:** Shows visual flagging of clauses with risk indicators and legal classifications.

 ISBN: 978-9982-95-500-3

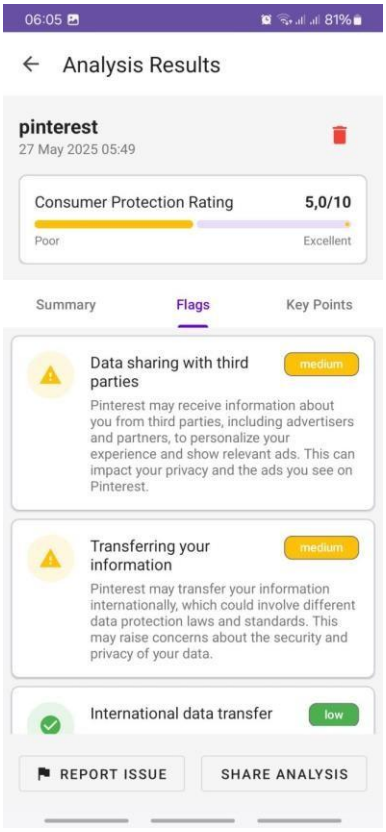

Fig 7. visual flagging of clauses with risk indicators

Each summary is accompanied by metadata indicating high-risk clauses such as:

c. Data sharing without consent
d. Unilateral termination rights
e. Arbitration or jurisdiction limitations Summaries also display a risk score (Low, Medium, High) to help users quickly assess exposure.

D. Evaluation Metrics and Performance

The system was evaluated using both **intrinsic NLP metrics** and **extrinsic user feedback**. A benchmark dataset comprising annotated Ts&Cs documents from the *ToS;DR* and *LegalBench* projects was used for reference comparisons.

1) Quantitative Evaluation:

Metric	Score
ROUGE-1	0.61
ROUGE-2	0.47
ROUGE-L	0.59
BERTScore (F1)	0.88

These results demonstrate high semantic fidelity between the generated summaries and human references. The **BERTScore of 0.88** indicates strong contextual alignment, consistent with legal-grade expectations as reported in recent GPT-based legal summarizers [1], [2]. These results echo improvements reported in smart IoT waste systems [32], assistive technology applications [34], and studies linking digital distraction to cognitive load [37].

E. Usability Testing

A usability study was conducted involving 20 participants with varied technical and legal backgrounds. Participants were asked to perform document analysis tasks using the application and rate their experience on a 5-point Likert scale.

Feature	Avg. Rating (1–5)
Clarity of summaries	4.0
Usefulness of flagged clauses	4.2
App responsiveness	3.5
Ease of use	4.6
Handling of domain-specific phrasing	3.9

While most participants found the summaries intuitive and informative, some reported occasional latency in analysis—especially with large files or URL parsing. Future optimization may involve offline caching or lightweight transformer distillation.

F. Comparative Evaluation

Table II compares the proposed system against existing legal summarization tools across four key parameters: target audience, automation, risk flagging, and mobile accessibility.

Table II — System Comparison Summary

System	Automation	Risk Analysis	Mobile Support	Target Users
ToS;DR [3]	Manual	Partial	No	General Users
LawGeex [4]	AI-powered	Yes (for lawyers)	No	Enterprise Legal Teams

 ISBN: 978-9982-95-500-3

GPT-3 LLM (Kolt) [2]	AI-powered	Experimental	No	Researchers
This Work	Fully AI-based	Yes (Real-time)	Yes	Consumers & Citizens

VI. Conclusion and Future Work

This paper presented the design, implementation, and evaluation of a mobile application that leverages advanced Natural Language Processing (NLP) and Large Language Models (LLMs) to simplify and analyze Terms and Conditions (Ts&Cs) documents. By integrating state-of-the- art technologies such as GPT-4o and clause-risk classification techniques, the system delivers concise, user-friendly summaries and flags potentially harmful contractual clauses in real time.

Quantitative evaluation using ROUGE and BERTScore metrics confirmed that the model- generated summaries exhibit strong alignment with human references. Usability testing validated the system's practicality, particularly among users with minimal legal expertise. Compared to existing tools, our system distinguishes itself through mobile accessibility, real-time analysis, and direct consumer applicability — addressing a key gap in digital consent transparency.

The broader societal relevance of this system aligns with global calls for algorithmic fairness and digital empowerment, particularly in contexts where users are often coerced into accepting opaque legal documents without comprehension. This is especially pertinent in the Global South, where access to legal expertise may be limited, and mobile-first AI tools can democratize access to legal literacy [1], [2].

I. Contributions

Key contributions of this study include:

a. A mobile-first AI platform for legal document summarization.
b. Multi-modal input ingestion including URL scraping and app scanning.
a. Clause-level risk flagging using transformer-based semantic analysis.
b. A unified evaluation framework combining quantitative NLP benchmarks and qualitative user testing.

II. Future Work

Several avenues for future development are envisioned:

- Multilingual Support: Expanding the summarization pipeline to support languages such as French, Arabic, and Swahili using multilingual LLMs [3].
- Crowdsourced Clause Feedback Loop: Incorporating user feedback on detected risks to refine classification accuracy through reinforcement learning.

This work contributes to an emerging body of research that positions AI not just as a tool of automation, but as an instrument of legal empowerment. As AI regulation matures globally, systems such as ours can assist in achieving compliance, transparency, and user agency in digital contracts. As demonstrated in environmental prediction systems [26] and SME- centered innovations [28], democratizing AI tools can yield high-impact outcomes when locally adapted. Future extensions will draw on best practices from previous e-health platforms and mobile recognition systems designed in Zambian contexts [33], [35].

REFERENCES

- A. Obar and J. Oeldorf-Hirsch, "The biggest lie on the Internet: Ignoring the privacy policies and terms of service policies of social networking services," Information, Communication & Society, vol. 21, no. 1, pp. 128–144, 2018.
- A. McDonald and L. Cranor, "The cost of reading privacy policies," I/S: A Journal of Law and Policy for the Information Society, vol. 4, no. 3, pp. 543–568, 2008.
- G. R. Milne and M. J. Culnan, "Strategies for reducing online privacy risks: Why consumers read (or don't read) online privacy notices,"

 ISBN: 978-9982-95-500-3

Journal of Interactive Marketing, vol. 18, no. 3, pp. 15–29, 2004.

- F. Marotta-Wurgler, "Will Increased Disclosure Help? Evaluating the Recommendations of the ALI's Principles of the Law of Software Contracts," University of Chicago Law Review, vol. 78, no. 1, pp. 165–185, 2011.

- D. J. Solove, "Introduction: Privacy self-management and the consent dilemma," Harvard Law Review, vol. 126, pp. 1880–1903, 2013.

- H. Nissenbaum, Privacy in Context: Technology, Policy, and the Integrity of Social Life. Stanford University Press, 2009.

- ToS;DR, "Terms of Service; Didn't Read." [Online]. Available: https://tosdr.org/

- LawGeex, "AI Contract Review Platform." [Online]. Available: https://www.lawgeex.com

- A. R. Patil, D. Mokashi, P. G. Rahate, et al., "Legal Rules and Regulations Document Summarizer: Regulatory Compliance with NLP, ML, and LLMs," Library of Progress, 2024. [Online]. Available: https://www.researchgate.net/publication/38490 7016

- C. Löffler, A. Martínez Freile, and T. Rey Pizarro, "Predicting potentially abusive clauses in Chilean terms of services with natural language processing," Artificial Intelligence and Law, Springer, 2025. [Online]. Available: https://arxiv.org/pdf/2502.00865

- P. Prabhakar and P. B. Pati, "Extractive Summarization of Indian Legal Judgments: Bridging NLP and Generative AI," in Generative AI: Current Trends and Applications, Springer, 2024.

- B. Żyłka, S. Kanojia, H. R. El-Taj, and B. Polok, "European Union's Perspective on Protection of Personal Data in the Era of GPT Technology," in Artificial Intelligence in Legal Systems, Taylor & Francis, 2023.

- L. Waidelich, M. Lambert, and Z. Al-Washash, "Using Large Language Models for the Enforcement of Consumer Rights in Germany," PLAIS EuroSymposium, Springer, 2023.

- N. Piscaglia, "Deep Learning for Natural Language Processing: Novel State-of-the-Art Solutions in Summarisation of Legal Case Reports," University of Bologna, 2023. [Online]. Available: https://amslaurea.unibo.it/id/eprint/20342/

- H. Mentzingen, N. António, and F. Bacao, "Effectiveness in retrieving legal precedents: Exploring text summarization and cutting-edge language models toward a cost-efficient approach," Artificial Intelligence and Law, Springer, 2025.

- R. Zhong et al., "LegalBench: A Collaborative Benchmark for Measuring Legal Reasoning in Large Language Models," arXiv preprint arXiv:2308.11462, 2023.

- S. Migliorini, "More Than Words: A Legal Approach to the Risks of Commercial Chatbots Powered by Generative Artificial Intelligence," European Journal of Risk Regulation, vol. 15, no. 1, pp. 44–67, 2024.

- R. Liepina, F. Lagioia, P. Pałka, and H. W. Micklitz, "Automating Legal Tasks: Perspectives on Transparency and Accountability," AI & Ethics, Springer, 2023.

- I. Benedetto, "Enhancing Legal Document Processing Through Natural Language Understanding and Generation Techniques," Ph.D. Thesis, 2025. [Online]. Available: https://tesidottorato.depositolegale.it

- S. Chihana, J. Mbale, N. Chaamwe, "Leveraging Machine Learning for Ambient Air Pollutant Prediction: The Zambian Mining Environment Context," Proc. ICICT-Zambia, vol. 4, no. 1, pp. 1–5, 2022.

- S. Chihana, J. Mbale, N. Chaamwe, "Unveiling the Nexus: Sulphur Dioxide Exposure, Proximity to Mining, and Respiratory

 ISBN: 978-9982-95-500-3

Illnesses in Kankoyo," Int. J. Environ. Res. Public Health, vol. 21, no. 7, p. 850, 2024.

- R. Phiri, J. Mbale, "Leveraging Machine Learning and Artificial Intelligence for Innovation and Sustainability in SMEs: A Case Study of Kalumbila," Proc. ICICT-Zambia, vol. 6, no. 1, pp. 56–62, 2024.
- N. Suresh, J. Mbale, A. Terzoli, T.K. Mufeti, "Enhancing Cloud Connectivity among NRENs in the SADC Region," Int. Conf. Emerging Trends in Networks and Computer Comm., 2015.
- Phiri, T.J. Zhao, C.H. Zhu, J. Mbale, "Using Artificial Intelligence Techniques to Implement a Multifactor Authentication System," Int. J. Comput. Intell. Syst., vol. 4, no. 4, pp. 420–430, 2011.
- Halubanza, "A Framework for an Early Warning System for the Management of the Spread of Locust Invasion Based on Artificial Intelligence Technologies," The University of Zambia, 2024.
- Chembe and B. Halubanza, "Smart Bin Management System: Transforming Waste Management with Internet of Things at Mulungushi University," Zambia ICT Journal, vol. 9, no. 1, pp. 31–37, 2025.
- N. Kasamu and B. Halubanza, "Facial Recognition-Based Attendance Management System," MULUNGUSHI UNIVERSITY MULTIDISCIPLINARY JOURNAL, vol. 5, no. 2, pp. 160–170, 2024.
- Sichilongo and B. Halubanza, "Gesture Controlled Home Automation for People with Disabilities," Proceedings of the International Conference for ICT (ICICT)-Zambia, vol. 6, no. 1, pp. 80–84, 2024.
- H. S. Kadakwiza Halubanza and D. Kunda, "A Framework for an E-Health System for Zambian Health Centres that Incorporates Data Mining Reporting," Zambia ICT Journal, vol. 4, no. 4, pp. 6–17, 2023.
- S. C. Kaoma and B. Halubanza, "Utilizing Machine Learning for Accurate Property Valuation: A Regression Model Analysis," Zambia ICT Journal, vol. 8, no. 1, pp. 34–46,
- 2024.
- Halubanza, S. Kadakwiza and J. Mulenga, "Distracted Minds and Declining Grades: Unveiling the Detrimental Effects of Digital Distraction on Student Academic Performance," Zambia Association of Public Universities and Colleges (ZAPUC) Conference Proceedings, vol. 3, 2023.
- B. Halubanza, D. Kunda and Y. Musonda, "An Assessment of Information Security Awareness Among Employees in Higher Education Sector in Zambia," Academia, 2016.

 ISBN: 978-9982-95-500-3