Universitetet i Stavanger

UIS BUSINESS SCHOOL

MASTER'S THESIS

Study program:	THESIS IS WRITTEN IN THE FOLLOWING SPECIALIZATION/SUBJECT:
Master's degree in business law	International dispute resolution / Law and technology

TITLE:

Language model AI and international commercial arbitration

AUTHOR:		
Candidate number: 3211	Name: Sindre Haugen	Supervisor: Jacob Ryan Adams

Executive summary

This thesis dives deep into the world of a specific type of artificial intelligence (AI), Large Language Models (LLMs), and how they might impact international business disputes, or more specifically, international commercial arbitration.

In an age where rapid advancement in technology is quickly reshaping our world, the legal field isn't immune to this transformation. Among the game-changers, language model AI could, due to its promising capacity of data-processing and outcome prediction, potentially make international arbitration quicker and less expensive, thereby providing easier access to justice for the commercial sector across the globe.

However, it's not all smooth sailing. The study also identifies legal limitations regarding the use of LLMs in arbitration - issues related to bias, maintaining fair processes, keeping data private, and determining who is accountable when AI is involved. Overcoming these obstacles is crucial before AI can be confidently incorporated into arbitration.

While LLMs hold exciting potential for international commercial arbitration, careful implementation is important. We need comprehensive rules and guidelines to ensure language model AI operates effectively and ethically in this arena. The use of AI should be a considered decision, keeping in mind the potential hurdles and working towards mitigating them.

Preface

As I present this thesis, it's important to recognize those who have been instrumental in its creation.

Firstly, I want to express my sincere gratitude to my supervisor, Jacob Ryan Adams. Your consistent guidance, insightful suggestions, and unwavering support have been very valuable to me. Your expertise has not only shaped my approach this thesis but also profoundly impacted my approach to legal thinking in general.

I also want to extend my thanks to my partner, Paula. Your steadfast support, understanding, and encouragement have been a source of strength, particularly during challenging periods. Thanks for believing in me.

To my friends and family, thank you for your continual support and patience over these years. The role you've played in this journey has been integral and your contributions invaluable.

With the culmination of five years of legal studies, this thesis represents not just academic achievement, but personal growth.

Once again, thank you to all those who have been part of this journey.

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1.0 Introduction

1.1 Research question

The chosen research question for this thesis is:

To what extent could Large Language Model AI (LLMs) enhance the efficiency and effectiveness of international commercial arbitration, and what are the legal and ethical challenges posed by their incorporation?

1.2 Methodological framework

This thesis aims to examine the use and potential implications of LLMs in international commercial arbitration. Its main focus will be on the potential concerns and benefits that arises from integrating such AI systems into arbitration processes.

A descriptive approach will be taken, providing a comprehensive understanding of the relationship between language-model AI and international commercial arbitration.

Firstly, the thesis will turn its attention to Artificial Intelligence, with an emphasis on LLMs. This will include an explanation of what AI is broadly, followed by a focused examination of language-model AI, its operation and potential applications. This section will be backed by literature and resources that detail the workings and capacities of such systems.

Next, the thesis will provide an overview of international commercial arbitration. This will encompass the key principles, structure, and roles within the process.

Having set the groundwork about both arbitration and AI, the thesis will then explore the intersection of these two domains. It will describe how LLMs can be woven into the fabric of the arbitration process and will pinpoint the specific facets of arbitration where AI could be most beneficial.

The following section will delve into potential challenges and drawbacks associated with the integration of AI in arbitration. This includes an examination of procedural and technical issues,

as well as concerns regarding due process, enforceability, and accountability. Each issue will be highlighted and discussed in light of relevant literature and case studies.

The penultimate section will present possible solutions as suggested by other researchers to the problems discussed earlier. Each proposed solution will be critically analyzed, with a focus on its practicality and potential impact on the arbitration process.

The final section will draw together the conclusions from the previous sections. It will underscore the potential benefits and challenges tied to the integration of LLMs in international commercial arbitration and discuss the proposed solutions. The end goal is to deliver a balanced perspective on the subject, offering valuable insights into the future of AI's role in arbitration.

1.3 Background

The presence of artificial intelligence (AI) has slowly but surely invaded our daily lives, transforming from a concept in the realm of science fiction to a reality of modern living. Despite the ever-present nature of AI in various forms - from our digital personal assistants to the algorithms determining our social media feeds - for many, AI remained a distant, impersonal concept.

However, it was not until November 30th, 2022, that the world experienced a pivotal shift in the narrative surrounding the average person's awareness of AI technologies. This shift was brought about by the unveiling of OpenAI's language model ChatGPT.[1] It's important to note, the technology underpinning ChatGPT was not revolutionary in itself – Large Language Models had been in existence for years. In fact, the foundational elements of AI and machine learning that powered ChatGPT were a product of years of dedicated research and gradual technological advancement.

What set this moment apart, however, was the convergence of several factors. The design and functionalities of ChatGPT highlighted the practical potential of AI language models in a manner that was previously unseen. This AI language model showcased the ability to process and generate human-like text at a speed and level of sophistication that renewed global interest in the capabilities of AI, and specifically AI language models.

[1] OpenAI. *Introducing ChatGPT*. (2022, November 30). Retrieved May 12, 2023, from https://openai.com/blog/chatgpt

Alongside the launch of ChatGPT, an industry of consultancies burgeoned, advising organizations on how to harness AI language models for their operations, and suggesting a broader interest in these technologies' potential applications, including in the legal field. This development, combined with the potential applications of AI within traditionally human-centric domains, elicited both excitement and apprehension in equal measure.

This thesis arises at the crossroads of these emotions - excitement, fear, uncertainty, and speculation. It aims to cut through the noise, the hype, and the multitude of opinions surrounding AI language models, focusing specifically on their application in international commercial arbitration. The goal is to explore the practical and ethical implications of utilizing such AI systems in this setting.

Can AI language-models genuinely enhance the efficiency and effectiveness of international commercial arbitration? If so, what legal and ethical challenges do they present, and can these challenges be appropriately addressed? By attempting to answer these critical questions, this thesis seeks to provide a balanced, researched, and thoughtful exploration of these issues, contributing valuable insights to the future of AI's role in international commercial arbitration.

1.4 Artificial Intelligence

Artificial Intelligence (AI), a term coined in 1955 by Stanford professor John McCarthy, was generally defined by McCarthy as machines behaving in ways which we would consider intelligent if observed in humans.[2]The Encyclopedia Britannica expands on this definition:

> the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.[3]

Further, the World Intellectual Property Organization (WIPO) gives the following explanation:

> There is no universal definition of artificial intelligence (AI). AI is generally considered to be a discipline of computer science that is aimed at developing machines and systems that can carry out tasks considered to require human intelligence. Machine learning and

[2] Scherer, M. *Artificial Intelligence and Legal Decision-Making: The Wide Open?* Journal of International Arbitration Volume 36, Issue 5 (2019). Page 542

[3] Encyclopedia Britannica. *Artificial intelligence*. (Last updated March 20, 2023). Retrieved May 14, 2023, from https://www.britannica.com/technology/artificial-intelligence

> deep learning are two subsets of AI. In recent years, with the development of new neural networks techniques and hardware, AI is usually perceived as a synonym for "deep supervised machine learning.[4]

WIPO explains machine learning as a technology that learns from examples. It works with what is known as "structured" or "training" data, which are sets of inputs and their corresponding expected outputs. The system refines itself and makes decisions based on this data, without a human having to specify each step of the process. This is akin to the way humans learn - for instance, a child recognizing different types of cups from various examples. In today's world, machine learning finds application in many areas, such as filtering unwanted emails, translating between languages, and recognizing voice commands, text, or images.[5]

Large Language Models (LLMs) and the transformer technology

Bearing in mind this framework of machine learning, where systems adapt and improve their performance based on exposure to structured data, we can begin to understand the evolution and complexity of large language models.

Large language models refer to AI systems that specifically work with language, creating a simplified but useful digital representation of it. Over the years, the trend has been to train language models with more parameters, resulting in better performance. This growth in the number of parameters is what has given rise to the term "large" in large language models. There are, however, ambiguities in this term, with no clear consensus on what should or shouldn't count as a language model, or what size of model should be considered "large".[6]

One particularly influential development in AI language models has been the introduction of "transformer" technology. Simply put, transformers enable these models to consider multiple data points within a sequence at once, instead of the more traditional method of analyzing data step-by-step. This greatly enhances their ability to understand context in intricate sentence structures and generate consistent responses, which is a crucial aspect in the realm of natural

[4] World Intellectual Property Organization. *Artificial Intelligence and Intellectual Property*. Retrieved May 7, 2023, from https://www.wipo.int/about-ip/en/frontier_technologies/ai_and_ip.html
[5] Ibid
[6] Toner, H. (2023, May 12). *What are generative AI, large language models, and Foundation models?* Center for Security and Emerging Technology. Retrieved May 14, 2023, from https://cset.georgetown.edu/article/what-are-generative-ai-large-language-models-and-foundation-models/

language processing tasks.[7] Grasping this technological advancement is fundamental when considering the potential influence of AI language models, such as ChatGPT, in domains as intricate as international commercial arbitration.

1.5 International Commercial Arbitration

Alternative dispute resolution (ADR)

Alternative Dispute Resolution (ADR) refers to the resolution of disputes outside of court litigation, which encompasses methods such as mediation, arbitration, conciliation, negotiation, and transaction.[8]

Each ADR method has its unique characteristics and rules, but it's crucial to note that these ADR methods are not mutually exclusive. Rather, they can be effectively combined. Parties might agree in their contracts to first attempt a friendly settlement via mediation or conciliation before resorting to arbitration or litigation if the initial method fails. This layered approach allows ADR methods to serve complementary roles in dispute resolution.

The main appeal of ADR lies in its speed, confidentiality, and flexibility compared to traditional court proceedings.[9]

What is arbitration?

Arbitration is fundamentally a straightforward alternate dispute resolution mechanism. The parties involved entrust their conflict to a chosen individual, an arbitrator. The arbitrator listens to all parties, weighs the facts and arguments, and reaches a decision. This decision is final and binding due to mutual agreement by the disputing parties. In essence, arbitration provides an efficient route to a binding resolution of a dispute or a series of disputes, circumventing recourse to a court of law. However, national laws and international treaties like the New York

[7] Uszkoreit, J. (2017, August 31). *Transformer: A novel neural network architecture for language understanding*. Google AI Blog. Retrieved May 14, 2023, from https://ai.googleblog.com/2017/08/transformer-novel-neural-network.html

[8] *Alternative dispute resolution*. Cornell Legal Information Institute. Retrieved April 31, 2023, from https://www.law.cornell.edu/wex/alternative_dispute_resolution

[9] Ibid

Convention[10] typically render such decisions enforceable by law if a losing party refrains from voluntary compliance.[11]

Despite the relaxed exterior, it's essential to remember that arbitration is not just an alternative to litigation but operates within a complex network of national and international laws.[12] A seemingly simple arbitration case may involve several different national legal systems and potentially international treaties or conventions, such as the UNCITRAL Model Law.[13]

The principle of party autonomy sits at the heart of international arbitration. This principle is not only endorsed in national laws but is also recognized by international arbitral institutions worldwide, as well as by international instruments like the New York Convention and the Model Law.[14] The Model Law's legislative history indicates that this principle was adopted unanimously. Furthermore, Article 19 of the UNCITRAL Model Law states that "*Subject to the provisions of this Law, the parties are free to agree on the procedure to be followed by the arbitral tribunal in conducting the proceedings'*"[15] reflecting the essence of party autonomy.

In broad terms, the parties of an arbitration can choose to do an "institutional arbitration" where they go to a specialist arbitral institution that usually has its own procedural rules, or they can do an "ad hoc" arbitration where the parties do not involve an arbitral institution and may choose to establish their own rules of procedure. Most of the time, even in ad hoc arbitration, the parties choose to follow an already established set of rules like the UNCITRAL Model Law.[16]

Due to the "wild" nature of some ad hoc arbitrations, and the large number of possibilities in the parties` choice of procedural law, the discussion in this thesis assumes that the agreement to arbitrate between the parties follows the procedural rules of the UNCITRAL Model Law.

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[10] *Convention on the Recognition and Enforcement of Foreign Arbitral Awards*. New York, 10 June 1958. *United Nations Treaty Series*, vol. 330, No. 4739, p. 3, available from treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXII-1&chapter=22&clang=_en

[11] Blackaby, N., Partasides, C., Redfern, A., & Hunter, M. (2015). *Redfern and Hunter on international arbitration* (6th ed.). Oxford University Press, USA. Page 5-6.

[12] Redfern and Hunter (2015). Page 6-7.

[13] United Nations Commission on International Trade Law, *UNCITRAL Model Law on International Commercial Arbitration 1985: with amendments as adopted in 2006* (Vienna: United Nations, 2008), available from www.uncitral.org/pdf/english/texts/arbitration/ml-arb/07-86998_Ebook.pdf.

[14] Redfern and Hunter (2015). Page 365.

[15] ibid

[16] Redfern and Hunter (2015). Page 45.

An international outlook on the legal framework surrounding International Commercial Arbitration

The legal infrastructure for international arbitration rests predominantly on two crucial instruments: the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York Convention), and the 1985 UNCITRAL Model Law on International Commercial Arbitration (UNCITRAL Model Law).

The New York Convention

The New York Convention, adopted by 156 contracting states, is a foundational treaty that facilitates the enforcement of foreign arbitral awards.[17] It articulates key principles that govern the enforceability of international arbitration agreements and awards, thereby ensuring the efficacy of arbitration as a means of dispute resolution in the context of international commerce.

The New York Convention ensures that the arbitral award forms an internationally binding resolution between the involved parties. If not voluntarily complied with, it can be enforced through any court of law (of a contracting state), taking into account certain reservation that follows from Article V of the convention.

The choice of arbitration by parties is not merely an agreement to engage in the process, but also to adhere to the final award. This understanding might seem self-evident, yet numerous arbitration rules expressly state it for the sake of clarity.[18]

The UNCITRAL Model Law

The UNCITRAL Model Law offers a blueprint for countries to update and harmonize their arbitration laws, addressing the specific demands of international commercial arbitration. It encompasses every facet of the arbitration process, from establishing the arbitration agreement, to outlining the structure and jurisdiction of the arbitral tribunal, defining the limits of court intervention, and detailing the acceptance and enforcement of arbitral awards. With its adoption

[17] *Contracting states*. New York Arbitration Convention. Retrieved May 7, 2023, from https://www.newyorkconvention.org/countries. See footnote 10.
[18] Redfern and Hunter (2015). Page 25.

by various countries across diverse economic and legal systems, the Model Law represents a global consensus on fundamental elements of international arbitration practice.[19]

The UNCITRAL Model Law and the New York Convention collaboratively establish a comprehensive and predictable framework for international arbitration. While maintaining simplicity, they impose formal requirements that uphold the legitimacy and efficiency of the arbitration process. This global system, along with national laws, contributes to the intricate landscape of international arbitration.

The Intersection Between International Commercial Arbitration and Large Language Models

Artificial Intelligence, particularly Language Model AI, and arbitration are two seemingly unrelated fields. However, when the technology of LLMs is integrated into the arbitral process, there just might be a potential to improve key areas of the process itself.

Language is a fundamental aspect of both law and arbitration. Law is largely a system of language—norms, statutes, and case laws are expressed through words and their specific interpretations have significant implications.[20] The same holds true in arbitration, where disputes are understood, argued, and resolved via legal arguments. In this context, the potential of Large Language Models (LLMs) becomes apparent.

These AI models are specifically designed to understand and generate human-like text.[21] A testament to the overall belief in their capabilities, for instance, is their application by the Icelandic government, which employs GPT-4[22] to help preserve the Icelandic language.[23] These capabilities could prove crucial in amplifying areas of a language-driven process like arbitration. They might assist in various stages of the arbitral process, from the initial case assessment to the formulation of the final award. The inherent connection between language,

[19]Explanatory paragraphs. *UNCITRAL model law on international commercial arbitration (1985), with Amendments as adopted in 2006*. United Nations Commission on International Trade Law. Retrieved May 9, 2023, from https://uncitral.un.org/en/texts/arbitration/modellaw/commercial_arbitration

[20] *Law and language*. (2002, December 5). Stanford Encyclopedia of Philosophy. Retrieved May 9, 2023, from https://plato.stanford.edu/entries/law-language/

[21] Markovski, Y. (2023). *How ChatGPT and our language models are developed*. OpenAI. Retrieved May 9, 2023, from https://help.openai.com/en/articles/7842364-how-chatgpt-and-our-language-models-are-developed.

[22] *GPT-4 is OpenAI's most advanced system, producing safer and more useful responses*. (2023). OpenAI. Retrieved May 29, 2023, from https://openai.com/gpt-4

[23] *How Iceland is using GPT-4 to preserve its language*. (2023, March 14). OpenAI. Retrieved May 29, 2023, from https://openai.com/customer-stories/government-of-iceland

law, arbitration, and LLMs provides an intriguing avenue for exploration and forms the backbone of the following section.

2.0 How could International Commercial Arbitration benefit from the use of Large Language Model AI?

Having established a basic understanding of Large Language Models (LLMs) and outlined key aspects of international commercial arbitration, it is time to further explore their intersection. How can LLMs and their capabilities fit into and potentially augment the arbitration process?

The goal of this chapter is not to forecast a certain future, but to articulate the potential of LLMs in the context of arbitration, opening the door to further research and discussion in this emerging field.

Identifying the pains of International Commercial Arbitration

According to Redfern and Hunter, the two main reasons to arbitrate is the ability to choose a neutral place for conflict resolution and the international enforceability of arbitral decisions.[24] These are qualities of the process itself and will very unlikely be influenced by the implementation of LLMs.[25] In a commercial context, cost and efficiency are key factors for most parties conducting business, and to the naked eye seems like areas that more likely could be influenced by language model AI.

Traditionally, arbitration has been regarded as a more efficient and cost-effective alternative to litigation.[26] However, for quite some time the expenses associated with arbitration have been escalating and becoming excessive. Despite efforts from leading arbitral institutions to manage arbitration costs, they continue to rise.[27] Hereunder, a 2015 survey From Queen Mary University of London have identified "cost" as being the most problematic aspect of

[24] Redfern and Hunter (2016). Page 31
[25] However, Public Policy reasons can potentially have an impact on the international enforceability. More on this in the «challenges» section of this thesis.
[26] Mururu, N. *Towards efficiency and economy in arbitration*. (2013). Alternative Dispute Resolution. Page 7
[27] Profaizer, J. R., Timofeyev, I. V., & Weiss, A. J. (2022, December 19). *Costs*. Global Arbitration Review. Retrieved May 14, 2023, from https://globalarbitrationreview.com/guide/the-guide-damages-in-international-arbitration/5th-edition/article/costs

international commercial arbitration.[28] Arbitral institutions have been introducing various kinds of expedited arbitrations as an attempt to meet the increasing time and costs of international commercial arbitration, for example Oslo Chamber of Commerce offers "Fast-Track Arbitration"[29] and the International Chamber of Commerce offers "Expedited arbitration".[30] However, these kinds of expedited arbitrations are recommended for "less complex cases"[31] of a relatively small disputed amount.[32] The purpose of this inclusion is to illustrate an acknowledged need for increased efficiency and reduced costs in the resolution of business disputes through arbitration.

In this chapter the arbitration process will be broadly split into two key phases: the preparatory phase including the proceedings, leading up to the arbitrator's decision, characterized by in-depth research and meticulous planning; and the subsequent decision-making phase, where all the groundwork laid previously is brought to bear.

Delving further into this subject could reveal that these tools might offer a new perspective to arbitration, potentially enhancing efficiency and reducing costs. Such possibilities, though speculative at this point, represent an interesting avenue of exploration in the larger pursuit of understanding AI's potential role in arbitration.

2.1 Implementation of LLMs in the preparatory phases of International Commercial Arbitration

The potential of LLMs in Research and Evidence Gathering

One of the potential areas where language model AI could have an impact is in research and evidence gathering during the preparatory phase of international commercial arbitration.

[28] *International arbitration survey: The evolution of international arbitration. (2018). Queen Mary University of London. Retrieved May 14, 2023, from https://arbitration.qmul.ac.uk/research/2018/*
[29] *Dispute resolution*. Oslo Chamber of Commerce. Retrieved April 20, 2023, from https://chamber.no/dispute-resolution/
[30] *Expedited procedure provisions*. ICC - International Chamber of Commerce. Retrieved April 25, 2023, from https://iccwbo.org/dispute-resolution/dispute-resolution-services/arbitration/rules-procedure/expedited-procedure/
[31] See footnote 29
[32] See footnote 30

Certain AI consulting agencies suggests that LLMs in general can greatly improve research methods.[33] And also that they are able to go through large sets of data quickly and precisely, saving researchers the time and money it would take to do this manually. In addition, to being able to find patterns and connections in the data that might not be noticeable at first glance. This can lead to new findings that would be tough to come across otherwise.[34]

They further propose that large language models hold the ability to produce new text and that this can facilitate the creation of document summaries, generation of new ideas, or even the drafting of complete documents.[35]

LLMs, with their alleged advanced capacity to comprehend and generate human-like text, could be an effective tool in automating and enhancing this process when it comes to research and evidence gathering in relation to international commercial arbitration.[36] This process is typically characterized by extensive research, sifting through stacks of legal documents, treaties, and case laws, and the collection of relevant, hereunder documentary, evidence. Such tasks can be time-consuming, labor-intensive, and consequently, expensive.

For instance, LLMs could quickly go through the contract of the parties, past arbitration cases[37], treaties, and other relevant documents, identifying and summarizing key points. This could save a considerable amount of time and resources, reducing the need for manual sifting through large amounts of data.

Additionally, LLMs could assist in organizing evidence. They could be designed to identify and extract pertinent information from the provided documents and data, ensuring that nothing relevant is overlooked. This could not only improve the efficiency of the evidence gathering process but also likely enhance its accuracy.

Facilitated document production

[33] Speak AI. Retrieved May 12, 2023, from https://speakai.co/
[34] *How to use large language models for research*. (2022, December 23). Speak AI. Retrieved May 12, 2023, from https://speakai.co/how-to-use-large-language-models-for-research/
[35] ibid
[36] See footnote 22
[37] Confidentiality is recognized as an «essential ingredient of arbitration» (*Hassneh Insurance Company of Israel vs Mew)* and due to this confidential nature of arbitration, there might be little or no case law, depending on the area.

Building on the earlier section, a further area where language model AI could bring advantages is in the realm of document production, an integral, yet often contentious aspect of international arbitration. The arbitration process typically relies heavily on documentary evidence over oral testimonies, making the efficient management of these documents critical.[38]

By "document production" both documents that parties produce for their own sake, as well as documents that the parties involuntarily must produce[39] are taken into account.

Due to the international aspect of international commercial arbitration, it is common for the involved parties, their legal representatives, and the arbitrators to come from different nations, each carrying their distinct legal backgrounds. Consequently, the breadth of document production tends to be impacted, at least partially, by the arbitrators´ legal education and professional experience. To put it in Redfern and Hunter´s words: "The phrase 'culture crash' is overused in the lexicon of modern arbitration, but often seems appropriate in the context of document production".[40]

Language Model AI has a potential when it comes to streamlining the process of producing documentary evidence in arbitration. Its fundamental function is to process large volumes of data efficiently, which includes scanning, classifying, and searching for relevant documents. This could significantly reduce the manual workload, making the process more efficient.

By applying pattern recognition and natural language understanding[41], LLMs can detect certain patterns or ideas that might otherwise be missed. It can also utilize past arbitration cases[42] to assess the potential relevance of certain documents, which could inform decisions about what documents to produce.

LLMs` functionality extends to drafting requests for document production, making sure they meet certain standards, and reviewing responses to these requests for potential discrepancies.[43] It can automate redaction of sensitive information, a common requirement before documents are shared, potentially reducing errors in this process.

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[38] Marghitola, R. (2014). *Document production in international arbitration*. Kluwer Law International B.V. Page 1.

[39] Redfern and Hunter (2015). Page 392.

[40] Redfern and Hunter (2015). Page 392.

[41] Rajasekharan, A. Zeng, Y. Padalkar, P. Gupta, G. *Reliable Natural Language Understanding with Large Language Models and Answer Set Programming*. (2023). Page 13-14 arXiv:2302.03780

[42] See footnote 37

[43] See footnote 34

Language Model AI can also be useful when taking into account differences between common law and civil law systems[44], which often influence the scope of document production in arbitration.[45]

Navigating Linguistic Complexities in International Arbitration with LLMs

Considering the potential of LLMs to streamline evidence gathering and document production, it's valuable to examine their potential in addressing a significant challenge in international arbitration—navigating through language barriers.

The international aspect of International Arbitration makes navigating language barriers an inherent challenge.[46] While it is true that parties, following the UNCITRAL Model Law, are free to agree on the language of the arbitration[47], problems may arise in everything from documents or witness testimonies that originates in different languages, to the communication between the client and his likely legal representative. The importance of good translation increases drastically in cases where one or more parties for example cannot cover the costs of legal representation.

Language considerations are significant in various stages of arbitration, from the preparation phase to the determination of the arbitration's outcome or subsequent court proceedings. To illustrate, in 2016, two cases demonstrated the substantial impacts of language considerations in arbitration proceedings. In one, an arbitral award was not confirmed due to a Chinese language notice of arbitration that did not reasonably alert an English-speaking respondent.[48] In another monetary high-stakes case involving the Russian Federation and Yukos Universal Limited, different linguistic approaches notably impacted the proceedings.[49]

[44] Especially because of the transformer technology, see footnote 7.
[45] Redfern and Hunter (2015). Page 392-400.
[46] Al Zayed, N. *The Language(s) of Arbitration and Its/Their Effects*. INTERNATIONAL JOURNAL of ARABIC ARBITRATION. (2009). Page 89.
[47] UNCITRAL Model Law, see footnote 13, Article 22 (1)
[48] CEEG Solar Sci & Tech Co vs. LUMOS LLS (10th Circuit 2016)
[49] Yukos Universal LTD vs. The Russian Federation. PCA CASE AA 227

In this context, the potential of Large Language Models (LLMs) comes into sharper focus. Studies have shown that LLMs such as ChatGPT and LLaMA[50] amplified by BigTrans[51] are able to have a multilingual ability on over 100 natural languages.[52] A quick recap to the earlier mention of the Icelandic government`s decision to use GPT-4 as an aid in preserving the Icelandic language also illustrates the potential.[53]

With their ability to comprehend and generate human-like text[54] in multiple languages, LLMs could serve as a bridge between different languages in international arbitration. This capacity could aid in translating documents, summarizing key points from various sources, and even drafting complete documents in different languages.

Moreover, LLMs could help mitigate the risk of procedural deficiencies related to language issues[55] and reduce the chances of false assessments of language matters that could potentially impact arbitration outcomes. By understanding and adapting to the linguistic context, LLMs could contribute significantly to reducing misunderstandings, thereby promoting fairness and efficiency in arbitration proceedings.

Lastly, due to LLMs ability to not only outperform previously known translation programs[56], but to maintain a high speed while translating efficiently[57], it would be fair to assume real-time translation is quickly being made possible. By eliminating the need for consecutive interpretation or waiting for translated documents parties can communicate and respond in real-time, reducing procedural delays and saving valuable time and resources.

Can LLMs be used to predict case outcomes ex-ante?

Building on the potential of LLMs in handling linguistic complexities, evidence gathering, and document production, we arrive at another promising application of these AI models – their

[50] *Introducing llama: A foundational, 65-billion-parameter language model*. (2023, February 24). Meta AI. Retrieved May 12, 2023, from https://ai.facebook.com/blog/large-language-model-llama-meta-ai/
[51] Yang, W., Li, C. Zhang, J., Zong, C. *BigTrans: Augmenting Large Language Models with Multilingual Translation Capability over 100 Languages.* (2023, May 29). https://doi.org/10.48550/arXiv.2305.18098. Page 8-9.
[52] Ibid
[53] See footnote 23
[54] See footnote 33
[55] See footnote 48 and 49
[56] Yang, W. Li, C. Zhang, J. Zong, C. (2023), see footnote 51, Page 9.
[57] Frąckiewicz, M. (2023, April 19). *How ChatGPT is enhancing the accuracy and speed of language translation*. TS2 SPACE. Retrieved June 4, 2023, from https://ts2.space/en/how-chatgpt-is-enhancing-the-accuracy-and-speed-of-language-translation/

capacity for prediction. Not only could this increase the efficiency of the arbitration process, but it could also bring a new level of strategic foresight into the field of international arbitration.

The capabilities of LLMs to analyze and interpret large datasets[58] open intriguing possibilities for their application within the legal sphere, especially in the context of arbitration proceedings. A study conducted by Aletras et al. (2016) provides a valuable framework for exploring these possibilities.[59]

In the study, the researchers trained machine learning algorithms using previous rulings from the European Court of Human Rights on Articles 3[60], 6[61], and 8[62], which respectively prohibit torture, protect the right to a fair trial, and protect the right to respect for private and family life. The choice of these articles was guided by their prevalence in the majority of the Courts decisions.

Using natural language processing and machine learning techniques, the researchers analyzed textual information from the rulings, including facts, laws, and procedures, without consideration for the background or potential political influence.[63] Even with this data limitation, the model predicted outcomes with 79% accuracy.[64]

Nevertheless, the study acknowledged several limitations. Firstly, access was limited to the published judgments' text and excluded other case documents Secondly, the conclusions drawn were based on the court's presentation of case facts rather than the parties' characterizations, which could hinder ex-ante outcome prediction.[65]

Despite these challenges, the rapid development of AI technology since the 2016 Aletras et al.'s study offers promising potential for overcoming such obstacles. The abilities of LLMs to

[58] Radford, A., Wu, J., Child, R., Luan, D., Amodei, D., Sutskever, I. & others (2019). *Language models are unsupervised multitask learners. OpenAI blog*, 1, 9. Page 10.
[59] Aletras et al. *AI predicts outcomes of human rights trials*. UCL news. (2016, October 24). Retrieved May 26, 2023, from https://www.ucl.ac.uk/news/2016/oct/ai-predicts-outcomes-human-rights-trials
[60] Council of Europe. (1988). Protocol to the Convention for the Protection of Human Rights and Fundamental Freedoms (European Convention on Human Rights) as amended by Protocol No. 11. In *Council of Europe Treaty Series 155*. Council of Europe. Article 3
[61] Id Article 6
[62] Id Article 8
[63] See footnote 59.
[64] Ibid
[65] Kasap, G. H. (2021). *Can artificial intelligence ("AI") replace human arbitrators? Technological concerns and legal implications.* Journal of Dispute Resolution, Vol. 2021, No. 2, 2021, Page 11-12. https://doi.org/10.31235/osf.io/k4g8s

process and interpret datahave expanded exponentially, which could enhance the predictive accuracy of these models in the field of international arbitration. [66]

A similar study was conducted in 2022 on Federal Small Claims Court appeals in the Brazillian 5th regional court. The authors trained three sophisticated deep learning language models on a considerable dataset of over 612,961 Federal Small Claims Courts appeals. Remarkably, all models outperformed human experts. [67] This research underscores the potential of natural language processing and machine learning in enhancing legal judgment predictions.

The researchers concluded with the following: *"We have shown that it is possible to use deep learning models to predict outcomes of appeals in Brazilian courts, achieving performance that is better than that resulting from analysis by human experts".*[68]

If parties can predict the likely outcome of a dispute with some degree of accuracy, they can make more informed decisions about whether to proceed with arbitration, negotiate a settlement, or even withdraw their claim altogether. This could save substantial time and money that would otherwise be spent on the lengthy arbitration process. In addition, relatively accurate case outcome predictions can help to focus the dispute resolution process. Parties might choose to concentrate their efforts on the most contentious issues or those where the prediction suggests the outcome is most uncertain, rather than spreading resources across all issues.

2.2 Implementation of LLMs in the decision-making process in International Commercial Arbitration

Navigating from the preparatory aspects of international commercial arbitration, the spotlight now turns onto the decision-making process. This stage of arbitration is where determinations that shape the outcomes of the arbitral process are made. The focus will be on assessing the implications of LLMs' integration in the decision-making phase of international commercial arbitration.

[66] See footnote 22.
[67] Jacob de Menezes-Neto, E., & Clementino, M. B. (2022). Using deep learning to predict outcomes of legal appeals better than human experts: A study with data from Brazilian federal courts. *PLOS ONE*, *17*(7). https://doi.org/10.1371/journal.pone.0272287 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9333285/
[68] ibid

In the sphere of International Commercial Arbitration, Article 28 (1) of the UNCITRAL Model Law stipulates that the arbitration panel or tribunal is responsible for making binding decisions.[69] Further, Article 31 (1) stipulatest that *«The award shall be made in writing (...) »*.[70]

As Redfern and Hunter emphasizes, this role of the tribunal is critical and distinct, separating arbitration from other dispute resolution methods, such as mediation and conciliation, which are more focused on achieving a negotiated settlement.[71]

The process of decision-making in arbitration is flexible and adaptive, adjusted to the specific circumstances of each case, in accordion with the will of the parties, but it still maintains a judicial nature. It's worth noting that the consequences for a tribunal failing to act judicially can be severe, potentially resulting in the annulment or non-enforcement of the tribunal's award. This concern could be especially relevant when considering the integration of Large Language Models (LLMs) and will be explored in the next section (3.0) of the thesis.

Could language model AI theoretically perform a judicial function in International Commercial Arbitration?

In theory, the prospect of integrating Large Language Models as arbitrators in international commercial arbitration presents potential benefits, particularly related to efficiency and cost-effectiveness.

Efficiency is one of the key areas where LLMs could potentially make a difference. As computational models, they can process and analyze extensive datasets quickly[72], streamlining the decision-making process in arbitration cases. Moreover, the availability of LLMs isn't constrained by regular working hours or time zones. This could make the arbitration process more flexible and accessible.

Regarding cost, the use of LLMs as arbitrators could potentially bring about savings in the long run. While there is an initial investment of up to millions of dollars involved in training such

[69] UNCITRAL Model Law, See footnote 13. Article 28
[70] Id Article 31
[71] Redfern & Hunter (2015). Page 23.
[72] See footnote 20

technology[73], its continuous operation could potentially reduce costs over time due to the abovementioned efficiency, flexibility and accessibility.

Further, it seems natural to give an overview of the requirements of being an appointed as an arbitrator in both the UNCITRAL Model Law and including various examples from national laws.

The UNCITRAL Model Law does not stipulate detailed qualifications for an arbitrator but provides some general rules. According to Article 11, "*No person shall be precluded by reason of his nationality from acting as an arbitrator, unless otherwise agreed by the parties."*[74] It also indicates that parties are free to agree upon the procedure for appointing the arbitrator(s).

The Norwegian "Arbitration Act"[75] stipulates that "*The arbitrators shall be impartial and independent of the parties and shall be qualified for the office*.", indicating no specific barrier against appointing a LLM as an arbitrator, as long as it has the potential to be *"impartial"* and *"qualified for the office*". However, it is stated in section 14 that "*When a person is approached in connection with his possible appointment as an arbitrator (...)"*[76], indicating that the arbitrator has to be a person.

Moreover, more legislations use gender pronouns when referring to arbitrators, implying that the arbitrator is a natural person. This is the case in for example, section 5 of the Federal Arbitration Act of the United States where it is stated that a court appointed arbitrator *«shall act under the said agreement with the same force and effect as if he or they had been specifically named therein».*[77]

Some other national laws, like the Swedish Arbitration Act (section 7)[78], explicitly mandate that an arbitrator should be a person in full capacity. Similarly, jurisdictions such as Vietnam[79] and China[80] require specific qualifications like having judicial or legal experience or specialized knowledge in a certain field of law. These qualifications inherently suggest a human arbitrator.

[73] *Behind the Millions: Estimating the Scale of Large Language Models*. (2023, March 31). Retrieved May 23, 2023, from https://towardsdatascience.com/behind-the-millions-estimating-the-scale-of-large-language-models-97bd7287fb6b
[74] UNCITRAL Model Law, see footnote 13. Article 11
[75] The Norwegian Arbitration Act – Section 13
[76] Id Section 14
[77] The Federal Arbitration Act of the United States – Section 5
[78] The Swedish Arbitration Act – Section 7
[79] Vietnam Law of Commercial Arbitration – Article 20
[80] Arbitration Law of the People´s Republic of China – Article 13

These linguistic nuances suggest a presumption of human arbitrators but do not explicitly rule out the possibility of LLM arbitrators. Therefore, it is plausible that, unless strict legislation is passed to the contrary, the role of LLM as an arbitrator may in theory be open to interpretation and potential adoption in the future. It is in that regard crucial to acknowledge that this discussion is based on the current legal landscape, which may evolve as AI and its applications continue to advance.

Even if an LLM could serve as an arbitrator, it is still important to remember the autonomy of the parties in choosing their arbitrator(s). As Article 11 (2) of the UNCITRAL Model Law stipulates: *"The parties are free to agree on a procedure of appointing the arbitrator or arbitrators (...)"*, as well as the opportunity to preclude a person (hereunder anyone) from acting as an arbitrator *"by reasons of his nationality"*, cf. Article 11 (1).[81]

To sum it up, with some exceptions, it seems theoretically possible that a LLM could be appointed as an arbitrator and thus perform a judicial function in International Commercial Arbitration.

Case prediction as a steppingstone towards award-rendering

The work of Aletras et al.[82] and the Brazilian 5th regional court study[83] underscores the predictive capabilities of AI models trained on substantial legal datasets. These advances open a path for the integration of LLMs into the arbitration process itself. We can imagine a scenario where these models contribute not just to ex-ante outcome prediction, but also to the decision-making process by offering informed and statistically backed suggestions.

With a reliable prediction model, LLMs could provide an initial analysis of the case, identifying the most likely outcomes based on legal precedent and the facts presented. This could serve as a starting point for arbitrators, saving them valuable time, and thereby the parties money, by focusing their review on key areas identified by the LLM. Further, arbitrators could consider these analyses when formulating the award, providing a data-driven layer[84] to their judgment. In this way, the arbitral award would be the product of a collaborative process between human

[81] UNCITRAL Model Law – Article 11
[82] See footnote 59
[83] See footnote 67
[84] See footnote 34

arbitrators and AI, combining the latter's data-processing capabilities with the former's nuanced understanding of law and ethics.

Furthermore, the integration of LLMs into the award-rendering process could also introduce a higher degree of consistency and predictability into arbitration proceedings. This could further enhance the appeal of arbitration as a dispute resolution mechanism.

3.0 Legal challenges and consequences regarding the implementation of LLMs in International Commercial Arbitration

Having explored the promising potential of LLMs in international arbitration, the attention will now shift towards the legal and ethical considerations associated with their implementation.

Parties willingly participate in arbitration, forgoing their right to a traditional court trial. This act is quite significant, hence, it's paramount that the arbitration process upholds the principles of fairness and integrity to justify this surrender of rights.[85] Arbitration doesn't float freely in a legal void. It abides mainly by two levels of regulation: one, the procedural rules agreed upon or adopted by the parties and the arbitral tribunal; and two, the law of the place where arbitration takes place.[86]

As the parties are free in choosing how they prepare their own case or weigh ex-ante decisions, the main legal considerations appear when LLMs are used by the arbitral tribunal and if an LLM is appointed as an arbitrator.

3.1 Legal considerations regarding implementation of LLMs in the decision-making process

The requirement of independence and impartiality

It is considered fundamentally important that the arbitrator(s) in international commercial arbitration are and remain impartial and independent from both the parties and the dispute itself.[87]

[85] Redfern and Hunter (2015). Page 6.
[86] Redfern and Hunter (2015). Page 162.
[87] Redfern and Hunter (2015). Page 262.

"Independence" in the context of arbitration generally pertains to the absence of any financial or other relationship between an arbitrator and any party. This concept can be objectively evaluated, as it doesn't concern the arbitrator's mental state.[88] On the other hand, "impartiality" is closely related to an arbitrator's potential bias, either towards a party or the dispute itself. Unlike independence, impartiality is a more abstract concept, as it primarily involves a state of mind and is therefore subjective in nature.[89]

The requirement of impartiality and independence solidifies the parties right to equal treatment, which is a fundamental principle in international arbitration, playing a vital role in ensuring fairness and procedural justice for all parties involved.[90] Redfern and Hunter highlights the significance of this principle, noting that both the New York Convention and the Model Law explicitly recognize the requirement to treat the parties with equality and provide them with a full opportunity to present their case.[91] This principle emphasizes the importance of affording each party an equal footing in the arbitral process. While the arbitral tribunal has the discretion to conduct the arbitration in a manner it deems appropriate, this discretion is subject to the overarching requirement of equal treatment.[92]

Equal treatment ensures that each party has an equal opportunity to present their arguments, respond to the opposing party's arguments, and have their case heard. It safeguards against any unfair advantage or bias that may arise in the arbitral proceedings. By upholding equal treatment, the arbitral process becomes more transparent, impartial, and conducive to the fair resolution of disputes.[93]

In the context of LLMs serving as arbitrators, "independence" denotes the absence of any built-in bias towards a party due to programming or training data. Taking into account that LLMs do not have feelings or a sense of group-identity this should not be problematic to ensure.[94]

"Impartiality", traditionally associated with an arbitrator's state of mind, translates differently when considering LLMs. While a language model AI does not possess a state of mind[95], the concept of "impartiality" could relate to the potential for the model to produce biased results

[88] Ibid
[89] Ibid
[90] Redfern and Hunter (2015). Page 366-367.
[91] Ibid
[92] Redfern and Hunter (2015). Page 162.
[93] Ibid
[94] Bostrom, N. (2014). *Superintelligence: Paths, dangers, strategies*. Oxford University Press, USA. Page 29.
[95] Ibid

due to skewed or unrepresentative training data. This even extends to bias among the groups that make and design the AI-systems.[96]

If there rise any "justifiable doubts" to the "impartiality or independence" in arbitration that follows the UNCITRAL Model Law, the arbitrator may be challenged according to article 12 (2).[97]

A justifiable doubt as to the impartiality of an AI language model, such as an LLM serving as an arbitrator, could arise under various circumstances, many of which are related to the nature of these models. It's worth noting that these doubts revolve around the potential for biased outcomes rather than the traditional conception of partiality tied to an arbitrator's personal biases.

One such circumstance could be if the LLM was trained on data that does not reflect a fair or balanced representation of the relevant legal principles, case law, and legal culture. This could result in a systematic bias in the decision-making of the AI model. For instance, if the training data over-represents a certain jurisdiction's case law or disproportionately features cases with specific outcomes, the AI's predictions may unintentionally favor these outcomes or legal perspectives, thus creating a justifiable doubt as to its impartiality.

Similarly, doubts may arise if the LLM was trained with proprietary data from one of the parties involved in the arbitration. This could create an inadvertent bias towards that party in the decision-making process. Even if this bias is unintentional, it could still raise reasonable doubts about the LLM's impartiality.

Transparency and Explainability – A foundation for reasoned decisions

The integration of LLMs into the realm of international commercial arbitration necessitates a robust consideration of transparency and explainability.

Transparency, in this context, represents the clarity and openness with which the operations of an AI system are conveyed.[98] In the instance of an LLM operating as an arbitrator, it means an

[96] Schwartz et al. *Towards a Standard for Identifying and Managing Bias in Artificial Intelligence* NIST (2022, March). Page 14. https://doi.org/10.6028/NIST.SP.1270
[97] UNCITRAL Model Law, see footnote 13. Article 12 (2).
[98] Rishi Bommasani, Daniel Zhang, Tony Lee, Percy Liang *Improving Transparency in AI Language Models: A Holistic Evaluation* (2023). Page 2. Retrieved May 27, 2023 from

unambiguous understanding of its operational mechanisms. Parties to the dispute, as well as any supervising entities, should be able to discern the path from the initial information input to the concluding arbitration decision. Such an understanding allows those involved to gain insights into the methods employed by the LLM in interpreting and applying the relevant laws. The decision-making process of the AI model thus becomes an open book rather than a metaphorical "black box".[99]

Explainability, in the context of LLM integration, is the necessary counterpart to transparency, regarding the AI system's capability to communicate the reasoning behind its decisions.[100] For an LLM to be truly explainable, it needs to do more than just arrive at an arbitral decision. It must be capable of providing an understandable explanation as to how it reached that decision. This explanation should clarify how it considered the specific legal principles, precedents, and facts of the case in its decision-making process.

Further, Article 30 of the UNCITRAL Model Law states that "*The award shall state the reasons upon which it is based, unless the parties have agreed that no reasons are to be given (...)"*[101], and therefore, in Model Law arbitration, a failure to provide a reasoned award will become unenforceable due to Article V 1. d) of the New York convention which states that:

> Recognition and enforcement of an award may be refused (…) proof that (…) the arbitral procedure was not in accordance with the agreement of the parties, or failing such agreement, was not in accordance with the law of the country where the arbitration took place.[102]

Transparency and explainability foster a sense of trust in the AI system.[103] When parties involved in arbitration comprehend the decision-making process, it should be fair to assume that they are more inclined to view the proceedings as fair and reliable. Transparency also provides an avenue for accountability. With a transparent LLM, its decisions and actions can be audited, allowing for review if a decision is disputed or leads to any form of controversy.

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https://hai.stanford.edu/sites/default/files/2023-02/HAI%20Policy%20%26%20Society%20Issue%20Brief%20-%20Improving%20Transparency%20in%20AI%20Language%20Models.pdf

[99] Ibid

[100] Mayank, M. (2022, April 23). *Explainable AI: Language models*. Retrieved June 12, 2023, from https://mohitmayank.medium.com/explainable-ai-language-models-b4b75f56bfe2

[101] UNCITRAL Model Law, see footnote 13. Article 30.

[102] New York Convention, see footnote 10. Article V.

[103] See footnote 98.

Moreover, explainability provides an opportunity to correct and improve the system.[104] By clarifying the rationale behind decisions, it enables the detection of errors or biases in the LLM, offering a pathway for refining the AI system based on tangible feedback.

However, the absence of these vital attributes could have significant impacts. A lack of understanding of the decision-making process might lead to a perception of the arbitration as arbitrary, resulting in mistrust in AI-aided arbitration. Non-transparent and unexplainable decisions could face heightened legal challenges, with the risk of disputing parties arguing that the process was arbitrary or that they weren't given an opportunity to understand and respond adequately. Without transparency, accountability becomes elusive, making it challenging to hold the right entities responsible for incorrect decisions.

Competency and Accuracy – Factual correctness

The principle of due process lies at the heart of a fair legal procedure, encompassing the understanding of case circumstances, the applicable laws, and the application of these laws to unravel the intricacies of the case.[105] This process is indeed a testament to intellectual prowess, which provokes thought about the possible role of LLMs as arbitrators, especially given the intricacies of establishing facts and interpreting legal stipulations.

Even though it may seem straightforward theoretically, the process of determining facts in practice is layered and complex and includes making legal conclusions regarding which facts are relevant, as well as determining which facts are irrelevant. [106] Parties involved in a dispute provide their individual perspectives of what they regard as important facts and the associated legal implications. The arbitration panel, despite the parties' best intentions, is then tasked with the formidable challenge of deciphering the relevance of these facts and gauging the sufficiency of the evidence provided.[107]

The legal question's resolution, together with the facts of the case, poses similar complexities. Legal verdicts, often presented in binary terms like validating jurisdiction, affirming contract

[104] See
[105] Kurkela, M., Turunen, S., & Conflict Management Institute. (2010). *Due process in international commercial arbitration*. Oxford University Press, USA. Page 141.
[106] Ibid
[107] Ibid

legitimacy, or identifying contract breaches, become tricky due to the overlapping domains of facts and law where the legal framework outlines what facts are legally relevant.

In light of these complexities LLMs require access to verified facts and corresponding laws to make a judgement, no matter if it is ex-ante or a final award. While this selective representation or exclusion of certain facts in a judgement doesn't necessarily reflect bias, it raises important questions about an AI arbitrator's approach to fact determination.

If a language model AI, is presented with each party's view of the facts, it must just like a "normal" arbitrator evaluate the relevance of these facts, examine the evidence provided, and determine its sufficiency for proving the facts.[108]

In international arbitration, arbitrators may need to proactively intervene, asking questions, requesting documentary evidence, or calling witnesses, to fully comprehend the case. Given that cases often hinge on facts, establishing the accuracy of these facts is crucial for safeguarding legal rights. If AI language model systems can't comprehend the complexity of the commercial world or lack common-sense reasoning, they may fall short in determining the necessity for witnesses, experts, or other appropriate actions to establish case facts.

The violation of due-process rights is another potential risk if AI arbitrators fail to offer the parties a chance to present their case or be heard, cf. Article 20 (1) of the Model Law.[109] The award could then risk being set aside or unenforced. The legitimacy of arbitration fundamentally rests on its perceived fairness by prospective parties and national courts if it is to remain a viable and attractive way for parties to resolve their disputes.

Data privacy and Security

The nature of arbitration proceedings signifies dealing with large amounts of sensitive data, including confidential business information, trade secrets, and personal data.

The safeguarding of personal data privacy and maintaining cybersecurity measures are topics that hold substantial importance in international commercial arbitration, especially when considering the integration of LLMs into the process. These elements, while not directly addressed within national arbitration laws or the core paragraphs of arbitral legislation, has an

[108] Ibid
[109] UNCITRAL Model Law, see footnote 13. Atricle 20 (1).

important indirect role due to potential restrictions on the use of personal data. Such restrictions could affect the disclosure of certain documents to another party or the filing of these documents as evidence in an arbitration procedure.[110]

When engaging an LLM in arbitration, data must be fed into the model for it to analyze.[111] This data may be pulled from a variety of sources, including past case records, legal databases, and documents related to the current dispute. Given the nature of this data, it's very important that it's handled with care to preserve its confidentiality and integrity. Unauthorized access, data leaks, or unapproved sharing could have severe legal and reputational consequences for all parties involved.

If a cybersecurity breach occurs during arbitration using LLMs, the fallout can be significant. Legal penalties may include fines or claims for damages, depending on the laws that apply. The situation becomes complex if a breach affects the integrity of the arbitration process or even leads to the annulment of the award.[112] For example, if tampered digital evidence influences the outcome or if information obtained improperly impacts the LLM's decisions, it throws the fairness of the entire process into question.

Data privacy considerations are equally important. Parties involved in an arbitration process have legal rights to their privacy. The use of LLMs should not infringe upon these rights. Compliance with various data protection regulations, like the General Data Protection Regulation (GDPR)[113] in the EU or for example the California Consumer Privacy Act (CCPA)[114] in the US, is mandatory and these standards offer guidance on handling personal data ethically and responsibly.

Further, the effective use of LLMs in arbitration might inherently require the use of data from previous cases of similar nature. Due to the confidential aspect of international commercial arbitration, this raises concerns about anonymization and the potential risk of re-identification.

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[110] Schäfer, E. G. W. (2021). Managing Data Privacy and Cybersecurity Issues. *Global Arbitration Review*. Retrieved May 23, 2023 from https://globalarbitrationreview.com/guide/the-guide-evidence-in-international-arbitration/1st-edition/article/managing-data-privacy-and-cybersecurity-issues,

[111] See footnote 34.

[112] See footnote 110.

[113] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation).

[114] California Consumer Privacy Act of 2018 [1798.100 - 1798.199.100] Retrieved June 13, 2023 from https://oag.ca.gov/privacy/ccpa

Public policy

The implementation of Large Language Models (LLMs) in international commercial arbitration necessitates a careful evaluation of public policy considerations. As outlined in the New York Convention's Article V (2) b, a court possesses the authority to decline recognition of a foreign arbitral award if it is found to be violating public policy.[115]

This principle serves as a guard for the enforcing courts duty to protect the fundamental interests and policies of the enforcing state[116], and its dynamic nature can lead to varying interpretations across different jurisdictions. Hence, the acceptance and application of LLM-aided arbitration can face unpredictable challenges in terms of adherence to public policy. For instance, concerns may arise about the transparency of LLM decision-making processes, their potential bias, or their capacity to truly comprehend and honor the nuances of human law.

Moreover, as previously mentioned, there could be apprehensions about data privacy and the potential misuse of sensitive information. Therefore, these diverse interpretations of public policy pose an unpredictable challenge in adopting LLMs universally in the realm of international commercial arbitration. These concerns, when viewed through the lens of public policy, could potentially limit the autonomy of parties choosing to employ LLMs in their arbitration processes.

Legal scholars note that limitations in the autonomy of the parties manifests itself during the phases of award challenge and enforcement. An arbitration award may be vacated, or its enforcement may be resisted if it contradicts the principles of public policy of the adjudicating court's jurisdiction. Thus, the governing law of the court (lex fori) becomes a decisive factor when evaluating the validity and enforceability of an arbitration award.[117]

Regarding setting aside an arbitral award due to violation of public policy Redfern and Hunter notes that if a national court at the place of arbitration determines (on its own initiative) that an award conflicts with the public policy of its own country, the award may be annulled. This principle is especially true for states that adopt the Model Law. The authors provide an example of a dispute over a casino's gaming profits taken to arbitration. The award made in this case

[115] New York convention, see footnote 10, Article V (2) b.
[116] Park, W. W. (2012). *Arbitration of international business disputes: Studies in law and practice*. OUP Oxford. Page 3y7.
[117] Cordero-Moss, Giuditta., *International Commercial Arbitration, Party Autonomy and Mandatory Rules*, Tano Aschehoug, 1999. P

would be valid in many states as they consider the underlying transaction to be a normal commercial one. However, in states where gambling is not tolerated, the award might be set aside on the basis that it offends public policy by upholding an illegal contract.[118]

AI systems, while sophisticated in their data processing abilities, may fail to fully understand the subtle intricacies of public policy across different jurisdictions. The reason is that these systems rely heavily on the data they are trained on and could struggle with subjective and multifaceted aspects like public policy. Therefore, decisions or awards facilitated by AI that fail to respect jurisdiction-specific societal norms and legal principles could be viewed as conflicting with public policy.

Interestingly, the use of AI in itself could be construed as a violation of public policy in some states or under certain circumstances. In light of this, the EU Commission considers AI, hereunder LLMs, a real risk and is in the process of developing a legal framework with "clear requirements and obligations regarding specific use of AI".[119]

Concerns around fairness, transparency, and accountability in arbitral proceedings are central to public interest. If AI operations lack transparency or for example if one party has better access to advanced AI technologies than the other, it could violate the principles of fair and transparent process and equal treatment.

Accountability

In the labyrinth of stakeholders potentially involved in the LLM-assisted arbitration system, including but not limited to developers, data providers, AI operators, and human arbitrators, the assignment of responsibility in the event of flawed or disputed LLM-generated or LLM-aided awards becomes a profound concern.

Can we hold developers accountable for creating the language model, or does the responsibility lie with the arbitrators who apply these systems to specific cases? Should the blame be placed on data providers if the AI's decision was skewed due to biased data? The answers to these questions are crucial before we can fully embrace AI in arbitration.

[118] Redfern & Hunter (2015). Page 609.
[119] The Commission of the European Union *Regulatory framework proposal on artificial intelligence* https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai, Accessed 13.06.2023.

Professionals across various fields, including lawyers, doctors, architects, and engineers, are expected to carry out their duties with utmost care and skill. This principle applies equally to arbitrators, who, like professionals in these other fields, are expected to exercise due care in their decision-making process.[120] This notion of accountability extends to arbitrators using LLMs in their decision-making process. If an arbitrator uses an LLM to produce a preliminary decision, they are still expected to exercise due care in reviewing, validating, and ultimately deciding upon the outcome based on the AI's suggestion. If negligence occurs in this process, causing harm to a party, the arbitrator, like any other professional, could face potential legal consequences.[121]

If LLMs acts as arbitrators, a unique circumstance arises. Their decisions are a result of machine learning processes, not individual decision-making.[122] While a human arbitrator can be held accountable for negligence or bias[123], a language model AI, as a non-human entity, cannot be legally held responsible in the traditional sense. This raises questions about the appropriate model of accountability. Should we reconsider accountability in the context of AI, or should human oversight be mandatory to assume responsibility? It is undeniable that the introduction of AI in international arbitration extends far beyond the realms of technical and legal considerations; it is, at its core, a profound ethical question.

3.2 Legal considerations during the preparatory phase

In the preparatory phase of international arbitration, many of the legal issues are the same as those in the decision-making phase, such as ensuring data privacy, security, and proper accountability. However, a key difference comes to mind, namely how the LLMs are chosen and used.

The LLM could be picked and used directly by the parties involved, or it could be suggested or provided by the arbitration institution. This difference is important because it can change who is responsible if something goes wrong and how well the process follows the rules and standards of the arbitration world.

[120] Redfern & Hunter (2015). Page 330.
[121] Ibid
[122] See footnote 21 and 34.
[123] See footnote 120.

When parties, hereunder their representatives, independently select an LLM, they carry the responsibility for the selection, self-implementation, and outcomes resulting from use of the language model. This choice allows the parties greater flexibility and control over the specific AI model used, but also places upon them the duty to ensure that the chosen LLM can handle the complexities that usually surrounds arbitration proceedings.

A recent example of a lawyer being fed made-up case law from ChatGPT and presenting this to an American court of law comes to mind. The lawyer expressed that *"he did not comprehend that the chatbot could lead him astray"*.[124] This example illustrates the importance of critically assessing any output received from an LLM, especially in a setting as serious as dispute resolution.

The independent choice of an LLM also raises important accountability questions. Should the AI system misinterpret information or fail to meet the required standards, the parties who selected the system generally bear the consequences. The potential for such errors necessitates that parties consider these possibilities during the preparatory phase. Risk assessment and mitigation strategies should be part of their arbitration planning. This might influence not only their choice of AI model but also their overall approach to the arbitration proceedings, including case presentation and argumentation strategy.

The integration of LLMs into the arbitration process also necessitates discussions about the AI system's transparency.

To summarize, the decision to use an independent or institution provided LLM in international commercial arbitration are inherently different and carries with them multiple considerations that need careful thought and planning during the preparatory phase. The efficiency and effectiveness gain that LLMs can offer must be balanced against their potential challenges.

4.0 Potential remedies to the legal challenges presented

Resolving the legal challenges associated with the implementation of LLMs in the decision-making phase in international commercial arbitration, as well as their use during the preparatory

[124] Benjamin Wiser, *The ChatGPT Lawyer Explains Himself* The New York Times https://www.nytimes.com/2023/06/08/nyregion/lawyer-chatgpt-sanctions.html, 09.06.2023, Accessed 14.06.2023 11:20

phase, necessitates exploring potential remedies. These remedies can include revisions to existing arbitration rules, creating new legal frameworks, providing clear guidelines on AI application, and incorporating safeguards to address data security and privacy issues.

A revision of these rules can facilitate the use of LLMs in arbitration and clearly define the parameters within which it operates. Referring to the earlier example of the EU Commissions decision to develop a legal framework for the use of AI,[125] something similar could be beneficial to international commercial arbitration. This could provide clarity on important issues such as accountability for flawed decisions, transparency of AI operations, and how AI decisions should align with principles of natural justice.

A provision might be made to incorporate periodic review and revision of the rules to keep pace with technological advancements. Simultaneously, jurisdictions worldwide would be encouraged to recognize decisions rendered by or with the help of language model AI if there was uniform legislation on the topic. This would help prevent inconsistencies and potential conflicts due to for example public policy.

This framework could identify and address the different legal implications of using LLM-AI in various arbitration stages. In the preparatory phase, for instance, it could provide guidance on the appropriate use of LLMs for tasks such as data analysis and document review. As well as during the decision-making process, hereunder facts and documentary evidence assessment, and delivery of arbitration awards. By defining standards for the validation and certification of these kinds of AI systems for use in arbitration, we help ensure a certain level of competency and reliability.

Clear, comprehensive, and accessible guidelines for AI use in arbitration can enlighten parties and institutions about AI's potential and limitations, enabling them to make informed decisions. These guidelines might cover areas including the selection of suitable AI models, the process of data input and instruction, the interpretation of AI decisions, and strategies to address any AI errors or system failures. They might also guide the evaluation of AI system performance and the use of feedback for system enhancement. As a mandatory precondition, accountability guidelines should be transparent and unequivocal before AI is integrated into arbitration.

[125] See footnote 124

Especially regarding data security and privacy

With the increased digitalization of arbitration processes, ensuring data security and privacy becomes paramount. Evidence and communication often happen digitally, making it easy for someone to change or fake data. So, it's important to have strong cyber safety measures in place to keep data genuine and secure. This can be done by limiting who can use the data and making sure regular data backups happen. Protecting privacy is also important because hackers can break into systems and steal confidential information. This is often due to weak security, software problems, or human mistakes. To prevent this, we need up-to-date security systems, strong passwords, careful monitoring, and user training.[126]

Additionally, thorough anonymization techniques will have to be implemented if use of previous cases is proven to be sufficiently beneficial and thus necessary in regard to efficiency. The European Data Protection Board (EDPB) has a detailed guide on anonymization techniques that could work as a starting point here.[127]

Requirement of effective collaboration

Implementing these remedies will require collaboration and cooperation between multiple stakeholders, including legal practitioners, arbitration institutions, technology experts, and policymakers. By embracing these changes, the legal fraternity can effectively harness the potential of LLMs in international commercial arbitration while minimizing its risks. In doing so, they can contribute to creating a more efficient, accessible, and reliable system of arbitration. The role of language model AI in arbitration is an evolving area, and these remedies should be flexible enough to adapt to the ongoing advancements and challenges in AI technology. By remaining open to learning and adaptation, the international arbitration community can ensure that they remain at the forefront of these technological developments and can continue to provide an effective and efficient means of dispute resolution.

[126] Schäfer (2021), see footnote 110

[127] ARTICLE 29 DATA PROTECTION WORKING PARTY *Opinion 05/2014 on Anonymisation Techniques* (10th of April 2014). Retrieved 11.06.2023 from https://ec.europa.eu/justice/article-29/documentation/opinion-recommendation/files/2014/wp216_en.pdf

5.0 Conclusion:

As the digital era continues to evolve, AI and machine learning are increasingly intersection into various sectors, including law. This thesis aimed to explore the potential of Large Language Models (LLMs) in impacting international commercial arbitration, aiming to assess their abilities to amplify efficiency and accuracy, while also critically examining the intricate legal and ethical hurdles accompanying their integration.

Undoubtedly, LLMs harbor a lot of potential to make international commercial arbitration more effective. They offer promising capabilities, such as instantaneous access to large datasets, swift analysis of multifaceted legal documents, and tools to predict case outcomes, all promising heightened efficiency and potential improvement in decision-making and case-preparation. Especially their adeptness in streamlining initial arbitration stages, including document drafting and review, could lead to significant reductions in time and costs, crucial in resolving commercial disputes.

LLMs also hold the key to overcoming linguistic hurdles in international commercial arbitration with their multilingual capabilities. This feature could significantly expedite proceedings, enhancing inclusivity and accessibility, and potentially leading to fairer and more equitable results.

However, the journey towards fully integrating LLMs into arbitration isn't without obstacles. Legally, accountability in instances of flawed or biased decisions raises complex questions. Who bears responsibility when an AI-driven decision goes awry? There is also concern over whether LLMs can offer reasoned decisions, a fundamental aspect of arbitration. The current “black box” nature of their operations somewhat obstructs the route to their conclusions, raising further questions of transparency.

Given the sensitive nature of the data handled in arbitration proceedings, data privacy and security are paramount. The potential for breaches could endanger the privacy rights of the parties involved and may even undermine the integrity of the entire arbitration process.

From an ethical standpoint, the incorporation of LLMs into arbitration presents several challenges. AI's lack of understanding of human experience and inability to exhibit empathy or adjust decisions based on cultural contexts may lead to outcomes that, while legally valid, could be deemed ethically inappropriate and therefore risk violating public policy. The risk of biases within AI models amplifies these concerns.

To address these complexities, dynamic and adaptable legal frameworks are essential, capable of keeping pace with rapidly evolving AI technology. Enhanced data security protocols, coupled with an emphasis on transparency and explainability in AI decision-making, are critical to ensuring fairness. Ethical guidelines specifically designed for AI in arbitration are also needed, reinforcing respect for human rights and values throughout the process.

To conclude, while LLMs offer exciting prospects for augmenting the efficiency and effectiveness of international commercial arbitration, their integration comes with a substantial amount of legal and ethical concerns. The findings of this thesis suggest that a thoughtful and deliberate approach, fortified by robust legal and ethical safeguards, is necessary. This will ensure that as LLMs ascend in arbitration, the resulting process will be more efficient, fair, and genuinely just. Continued research in this area is vital to guide this evolution, ensuring that as we make advances in technology, we remain firmly anchored to the fundamental human principles and values that form the cornerstone of international dispute resolution and hereunder, justice.

References in alphabetical order

Al Zayed, N. The Language(s) of Arbitration and Its/Their Effects. INTERNATIONAL JOURNAL of ARAB ARBITRATION. (2009). Page 89.

Aletras et al. AI predicts outcomes of human rights trials. UCL news. (2016, October 24). Retrieved May 26, 2023, from https://www.ucl.ac.uk/news/2016/oct/ai-predicts-outcomes-human-rights-trials

Alternative dispute resolution. Cornell Legal Information Institute. Retrieved April 31, 2023, from https://www.law.cornell.edu/wex/alternative_dispute_resolution

Arbitration Law of the People´s Republic of China

ARTICLE 29 DATA PROTECTION WORKING PARTY Opinion 05/2014 on Anonymisation Techniques (10th of April 2014). Retrieved 11.06.2023 from https://ec.europa.eu/justice/article-29/documentation/opinion-recommendation/files/2014/wp216_en.pdf

Behind the Millions: Estimating the Scale of Large Language Models. (2023, March 31). Retrieved May 23, 2023, from https://towardsdatascience.com/behind-the-millions-estimating-the-scale-of-large-language-models-97bd7287fb6b

Benjamin Wiser, The ChatGPT Lawyer Explains Himself The New York Times https://www.nytimes.com/2023/06/08/nyregion/lawyer-chatgpt-sanctions.html, 09.06.2023, Accessed 14.06.2023 11:20

Blackaby, N., Partasides, C., Redfern, A., & Hunter, M. (2015). Redfern and Hunter on international arbitration (6th ed.). Oxford University Press, USA.

Bostrom, N. (2014). Superintelligence: Paths, dangers, strategies. Oxford University Press, USA.

California Consumer Privacy Act of 2018 [1798.100 - 1798.199.100] Retrieved June 13, 2023 from https://oag.ca.gov/privacy/ccpa

CEEG Solar Sci & Tech Co vs. LUMOS LLS (10th Circuit 2016)

Contracting states. New York Arbitration Convention. Retrieved May 7, 2023, from https://www.newyorkconvention.org/countries

Convention on Human Rights) as amended by Protocol No. 11. In Council of Europe Treaty Series 155. Council of Europe.

Convention on the Recognition and Enforcement of Foreign Arbitral Awards. New York, 10 June 1958. United Nations Treaty Series, vol. 330, No. 4739, p. 3, available from treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXII-1&chapter=22&clang=_en

Cordero-Moss, Giuditta., International Commercial Arbitration, Party Autonomy and Mandatory Rules, Tano Aschehoug, 1999.

Council of Europe. (1988). Protocol to the Convention for the Protection of Human Rights and Fundamental Freedoms (European

Dispute Resolution, Vol. 2021, No. 2, 2021, Page 11-12. https://doi.org/10.31235/osf.io/k4g8s

Dispute resolution. Oslo Chamber of Commerce. Retrieved April 20, 2023, from https://chamber.no/dispute-resolution/

Encyclopedia Britannica. Artificial intelligence. (Last updated March 20, 2023). Retrieved May 14, 2023, from https://www.britannica.com/technology/artificial-intelligence

Expedited procedure provisions. (n.d.). ICC - International Chamber of Commerce. Retrieved April 25, 2023, from https://iccwbo.org/dispute-resolution/dispute-resolution-services/arbitration/rules-procedure/expedited-procedure/

Explanatory paragraphs. UNCITRAL model law on international commercial arbitration (1985), with Amendments as adopted in 2006.. United Nations Commission on International Trade Law. Retrieved May 9, 2023, from https://uncitral.un.org/en/texts/arbitration/modellaw/commercial_arbitration

Frąckiewicz, M. (2023, April 19). How ChatGPT is enhancing the accuracy and speed of language translation. TS2 SPACE. Retrieved June 4, 2023, from https://ts2.space/en/how-chatgpt-is-enhancing-the-accuracy-and-speed-of-language-translation/

GPT-4 is OpenAI's most advanced system, producing safer and more useful responses. (2023). OpenAI. Retrieved May 29, 2023, from https://openai.com/gpt-4

How Iceland is using GPT-4 to preserve its language. (2023, March 14). OpenAI. Retrieved May 29, 2023, from https://openai.com/customer-stories/government-of-iceland

International arbitration survey: The evolution of international arbitration. (2018). Queen Mary University of London. Retrieved May 14, 2023, from https://arbitration.qmul.ac.uk/research/2018/

Introducing llama: A foundational, 65-billion-parameter language model. (2023, February 24). Meta AI. Retrieved May 12, 2023, from https://ai.facebook.com/blog/large-language-model-llama-meta-ai/

Jacob de Menezes-Neto, E., & Clementino, M. B. (2022). Using deep learning to predict outcomes of legal appeals better than human experts: A study with data from Brazilian federal courts. PLOS ONE, 17(7). https://doi.org/10.1371/journal.pone.0272287

Kasap, G. H. (2021). Can artificial intelligence ("AI") replace human arbitrators? Technological concerns and legal implications. Journal of

Kurkela, M., Turunen, S., & Conflict Management Institute. (2010). Due process in international commercial arbitration. Oxford University Press, USA.

Law and language. (2002, December 5). Stanford Encyclopedia of Philosophy. Retrieved May 9, 2023, from https://plato.stanford.edu/entries/law-language/

Marghitola, R. (2014). Document production in international arbitration. Kluwer Law International. Page 1.

Markovski, Y. (2023). How ChatGPT and our language models are developed. OpenAI. Retrieved May 9, 2023, from https://help.openai.com/en/articles/7842364-how-chatgpt-and-our-language-models-are-developed

Mayank, M. (2022, April 23). Explainable AI: Language models. Retrieved June 12, 2023, from https://mohitmayank.medium.com/explainable-ai-language-models-b4b75f56bfe2

Mururu, N. Towards efficiency and economy in arbitration. (2013). Alternative Dispute Resolution. Page 7

OpenAI. Introducing ChatGPT. (2022, November 30). Retrieved May 12, 2023, from https://openai.com/blog/chatgpt

Park, W. W. (2012). Arbitration of international business disputes: Studies in law and practice. OUP Oxford.

Profaizer, J. R., Timofeyev, I. V., & Weiss, A. J. (2022, December 19). Costs. Global Arbitration Review. Retrieved May 14, 2023, from https://globalarbitrationreview.com/guide/the-guide-damages-in-international-arbitration/5th-edition/article/costs

Radford, A., Wu, J., Child, R., Luan, D., Amodei, D., Sutskever, I. & others (2019). Language models are unsupervised multitask learners. OpenAI blog, 1, 9. Page 10.

Rajasekharan, A. Zeng, Y. Padalkar, P. Gupta, G. Reliable Natural Language Understanding with Large Language Models and Answer Set Programming. (2023). Page 13-14 arXiv:2302.03780

Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)-

Rishi Bommasani, Daniel Zhang, Tony Lee, Percy Liang Improving Transparency in AI Language Models: A Holistic Evaluation (2023). Page 2. Retrieved May 27, 2023 from https://hai.stanford.edu/sites/default/files/2023-02/HAI%20Policy%20%26%20Society%20Issue%20Brief%20-%20Improving%20Transparency%20in%20AI%20Language%20Models.pdf

Schäfer, E. G. W. (2021). Managing Data Privacy and Cybersecurity Issues. Global Arbitration Review. Retrieved 23.05.2023 from https://globalarbitrationreview.com/guide/the-guide-evidence-in-international-arbitration/1st-edition/article/managing-data-privacy-and-cybersecurity-issues

Scherer, M. Artificial Intelligence and Legal Decision-Making: The Wide Open? Journal of International Arbitration Volume 36, Issue 5 (2019). Page 542

Schwartz et al. Towards a Standard for Identifying and Managing Bias in Artificial Intelligence NIST (2022, March). Page 14. https://doi.org/10.6028/NIST.SP.1270

Speak AI. Retrieved May 12, 2023, from https://speakai.co/How to use large language models for research. (2022, December 23). Speak AI. Retrieved May 12, 2023, from https://speakai.co/how-to-use-large-language-models-for-research/

The Commission of the European Union Regulatory framework proposal on artificial intelligence https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai, Accessed 13.06.2023

The Federal Arbitration Act of the United States

The Norwegian Arbitration Act

The Swedish Arbitration Act

Toner, H. (2023, May 12). What are generative AI, large language models, and Foundation models? Center for Security and Emerging Technology. Retrieved May 14, 2023, from https://cset.georgetown.edu/article/what-are-generative-ai-large-language-models-and-foundation-models/

United Nations Commission on International Trade Law, UNCITRAL Model Law on International Commercial Arbitration 1985: with amendments as adopted in 2006 (Vienna: United Nations, 2008), available from www.uncitral.org/pdf/english/texts/arbitration/ml-arb/07-86998_Ebook.pdf.

Uszkoreit, J. (2017, August 31). Transformer: A novel neural network architecture for language understanding. Google AI Blog. Retrieved May 14, 2023, from https://ai.googleblog.com/2017/08/transformer-novel-neural-network.html

Vietnam Law of Commercial Arbitration

World Intellectual Property Organization. Artificial Intelligence and Intellectual Property. Retrieved May 7, 2023, from https://www.wipo.int/about-ip/en/frontier_technologies/ai_and_ip.html

Yang, W. Li, C. Zhang, J. Zong, C. BigTrans: Augmenting Large Language Models with Multilingual Translation Capability over 100 Languages (2023). https://doi.org/10.48550/arXiv.2305.18098.

Yukos Universal LTD vs. The Russian Federation. PCA CASE AA 227 [Original source: https://studycrumb.com/alphabetizer]