

Dear delegates of CIMUN VII,

Welcome to the International Atomic Energy Agency (IAEA) committee!

My name is Yudan Sun, a sophomore at Korea International School, Jeju Campus, and I am truly honored to be able to serve as the Head Chair of the IAEA Committee of CIMUN VII. This is my 5th year involved in the Model UN circuit, and my MUN journey has involved serving as a chair in diverse prestigious conferences, including TASMUN, YMUNK, JejuMUN, and GECMUN. I cannot wait to get to know all of you delegates at the conference.

I am Hyojin (Josephine) Choi, a sophomore at KISJ. I am honored to serve as your Deputy Chair of the IAEA committee. Throughout the conference, I hope to foster active discussions and creative approaches addressing the role of AI for strengthening nuclear security and regulations for increasing the efficiency of radioactive materials according to your country's policies. To make a productive conference, I highly recommend that you conduct thorough research on the nuclear policies and regulatory framework of your country, enabling you to contribute more effectively and come out with even higher-quality resolutions. I am looking forward to watching your passionate speeches in the upcoming CIMUN 7th iteration.

My name is Yeonjoon (Anthony) Kim, a freshman attending Chadwick International. I will be serving as your Associate chair in the IAEA committee at this CIMUN conference. As a person who has actively been part of a multitude of conferences and even chaired one myself, I deeply understand how important the role of the chair is in fostering fruitful discussion. Throughout the conference, I will try my best to ensure that professional and generative discussions are taking place. I will be looking forward to seeing all of you reading this on the day of the conference.

Our committee will be a debatable, advanced committee of Middle School delegates, and the chairs are anticipating fruitful and engaged discussions with excitement. Despite the nature of our committee being competitive, please acknowledge that chairs are aware of the different levels of experience each delegate has in Model UN, and are open to assisting delegates with adequate support as needed. We also want all of you to have fun — please remember that the most valuable takeaway from Model UN is the enjoyment of the process.

See you all at CIMUN VII!

Best regards,

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Hyojin Choi, Deputy Chair — hjchoi28@kis.ac

Anthony Kim, Assistant Chair — ykim29@chadwickschool.org

Committee Intro:

The International Atomic Energy Agency (IAEA) is a global central intergovernmental forum for cooperation and discussion of peaceful uses of nuclear energy and ethical development in atomic science. It was established in 1957 and is working under the umbrella of the United Nations with an aim to “assist its Member States, in the context of social and economic goals, in planning for and using nuclear science and technology for various peaceful purposes, including the generation of electricity, and facilitates the transfer of such technology and knowledge in a sustainable manner to developing member states”.

The IAEA monitors nuclear plants, checks the accountancy of materials, and ensures that member states are adhering to the Nuclear Non-Proliferation Treaty. It is also working on the formulation of international regulations to make nuclear plants safe and assist member states in coordinating a response and developing a structure to act in case of a nuclear accident.

In an era that is marked by increasing geopolitical tension over energy, emerging reactor technologies, and heightened concerns about the vulnerability of nuclear facilities to failure, the IAEA’s role has become increasingly necessary.

Agenda Introduction - A

Assessing the Role of Artificial Intelligence in Strengthening Nuclear Security and Safeguards

Artificial Intelligence (AI) is a rapidly emerging technology with great emerging potential in multiple working fields, such as global governance, security, and the technical sectors and more. Its rapid emergence and rapid recent developments presents both challenges and opportunities for nuclear development sectors. As nuclear verification, management, security and more assets generate increasingly complex datasets for processing, AI and machine learning technologies are being explored as tools to enhance and optimize these processes. The IAEA recognizes AI’s transformative potential, particularly in data analysis and monitoring applications, and has initiated discussions and technical activities to assess its responsible integration into nuclear security and safeguarding.

Within the subject of safeguard implementation, AI systems may assist by processing satellite imagery to find undeclared facilities, spotting anomalies and suspicious activity in material declarations, and assisting inspectors with high-risk verification tasks. The efficiency and efficacy of safeguarding measures can be strengthened by automating repetitive tasks and delegating them to AI technology, freeing up human experts to concentrate on complex evaluative judgements. Furthermore, AI has the potential to strengthen the cybersecurity measures, identify anomalous operational behaviour in digital systems, and enhance threat assessment in the context of nuclear safety.

However, the adoption of AI in nuclear contexts also raises safety, security, and governance concerns. Machine learning models fundamentally have a small margin of unpredictability, which is a risk that is difficult to take in nuclear development contexts. Furthermore, machine learning models and AI systems are directly influenced by data quality and accuracy, making them prone to bias, whether

intentional or unintentional. Unlike traditional deterministic systems, “smart” AI models may evolve through data training processes, potentially leading to unwanted changes or further unpredictability.

Taking into consideration these mutual risks and opportunities, it is imperative that member states thoroughly assess the integration of AI technology into nuclear safeguards and security regimes without undermining the established regulations. As a rapidly emerging technology, artificial intelligence can reshape nuclear operations. Through the exhaustive evaluation of technician capabilities along with legal and ethical considerations, member states must work to ensure that AI enhances nuclear verification with transparency and security.

Historical Background

The modern structure of international atomic technology management emerged from the aftermath of the second world war—commonly referred to as the Atomic Age—where concerns over the proliferation of nuclear and thermonuclear weapons development brought forth the desire to create global governance structures to regulate nuclear technology. The establishment of the International Atomic Energy Agency (IAEA) in 1957 marked the first major effort to balance the promotion of the development of atomic science whilst simultaneously managing development of nuclear and thermonuclear weapons. Initially, the agency’s activities focused on verifying the verification of nuclear materials provided through international cooperation. These safeguards relied primarily on physical, tangible inspection and technical monitoring by trained inspectors.

The IAEA committee greatly increased its influence and activity following the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was adopted in 1967. To put it briefly, the treaty established a worldwide framework that mandates that any non-nuclear-weapon state conduct its nuclear operations under IAEA safeguards in order to formally prove and guarantee through an official organization that its materials are used for peaceful, developmental purposes. The tools required for the IAEA were expanded in tandem with the growth of nuclear technology and the depth of its understanding.

The revelation of Iraq’s clandestine nuclear activities after the Gulf War revealed major weaknesses in the existing system of safeguards, especially in the detection of undeclared and/or covert nuclear activities. As a solution to this problem, the IAEA devised the Additional Protocol (AP), which greatly enhanced the scope of the IAEA’s authority. The IAEA could now use a wider variety of intelligence sources to collect a larger variety of information.

Simultaneously with these developments, the nuclear industry as a whole began substantial change due to advances in digital technologies and computing. By the early 21st century, nuclear programs were depending more on automated monitors, digital instruments and analysis, and software programs that were made to operate nuclear systems more effectively than people. Although this was able to significantly reduce human risk, it also brought with it a number of new difficulties. Numerous national and international regulatory organisations, including the Office for Nuclear

Regulation, consequently began to look into how the implementation of this may impact nuclear security and safety.

Today, the international community faces a new challenge: integrating advanced computational technologies into a highly sensitive domain. The rapid growth of machine learning in the 2010's demonstrated the potential of artificial intelligence (AI) systems to analyze datasets, detect anomalies, and otherwise automate some analytical processes that were previously done by humans. Recognizing these possibilities within this emerging technology, the IAEA initiated research and collaborative discussions on the responsible integration of AI into nuclear safeguards and nuclear facility management. Regulatory guide documents such as "Considerations for Developing Artificial Intelligence Systems in Nuclear Applications" highlight both the positives and risks associated with this emerging technology.

Major Stakeholders

U.S.A

Through agencies such as the Department of Energy and the U.S. The Nuclear Regulatory Commission (NRC), the United States has consistently provided funding for research on machine learning applications for nuclear safety and security analysis. The implementations of artificial intelligence technology have been researched in the last decade by national laboratories in the United States. For instance, the NRC has in recent times worked with other international regulatory bodies, like the Office for Nuclear Regulation in the UK, to publish guidelines on the development of AI technology in nuclear environments, as discussed in the historical background. The United States has continued to invest heavily in AI research for nuclear energy management and non-proliferation verification.

China

China has emerged as another significant stakeholder due to its rapidly expanding nuclear energy program. In recent years, China has begun to incorporate AI into energy sectors, including nuclear reactor operations. Chinese institutions and nuclear corporations have explored AI-driven diagnostics and automation within nuclear plants, with the UN recognising them as being "effectively woven" into their nuclear program. China has participated in international discussions within the International Atomic Energy Agency regarding emerging technologies, although its long-term strategy remains tied to domestic development and strategic autonomy in its computing systems

Russian Federation

The Russian Federation is another clear player in nuclear power development. With advanced nuclear technology research, Russia has historically played a critical role in the global nuclear energy sector. Russian institutions, famously Rosatom, have long explored the application of AI technologies in nuclear infrastructure diagnostics, maintenance, and streamlining of procedures. Russia has also been participating in international discussions through IAEA, on emerging digital technologies in nuclear

nuclear operations. In the coming years, the Russian Federation is expected to continue its pursuit in expanding the integration of AI technologies into its nuclear energy programs.

Japan

Due to its rapidly developing electronics and computer science industry, coupled with its emphasis on nuclear safety in the wake of the Fukushima nuclear accident in 2011, Japan has become a significant stakeholder of this agenda. In response to the aforementioned accident of Fukushima, Japan's nuclear sector has significantly increased its research into automation and digital monitoring technologies, specifically with the purpose of minimizing human error and early warning and diagnosis of accidents in nuclear plants. Moving forward, Japan's AI technologies are anticipated to be crucial in preventing further nuclear accidents as the country recovers and continues to develop its nuclear program

Possible Solutions

Solution 1:

International AI Safeguards

Overview

One major solution would be the creation of an international regulatory framework governing the use of artificial intelligence in nuclear safeguards. Currently, whilst research programs exist, there is a noticeable lack in the unified standard specifically regulating and outlining the usage of AI technology in nuclear verification systems. Establishing such a framework under the IAEA would ensure that AI technologies are used responsibly while maintaining the transparency and reliability required for nuclear non-proliferation.

Key Components

1. International AI Guidelines for Nuclear Application

The IAEA could develop standardized guidelines outlining how AI systems may be safely and securely integrated into nuclear safeguard operations. These guidelines could focus on principles such as international nuclear material transparency, explainability, and reliability of AI technologies in verification systems

2. Verification and Validation Standards

Member states could suggest testing and validation procedures to ensure that the AI technology integrated into nuclear programs is actually reliable and accurate. This would address concerns about transparency raised by various regulatory authorities regarding the unpredictability of machine learning systems, notably the "Black Box" problem in many widely used AI systems.

3. Human Oversight Requirement

Member states could discuss the extent to which human intervention is required when AI technologies are integrated into Nuclear Programs, along with whether AI should remain a tool to support human decision-making or whether AI technologies should be allowed to make administrative decisions on their own.

Outcome

This solution would increase international trust in AI-assisted safeguard systems while reducing the risk of misuse or unreliable decisions by algorithmic processes, mitigating mistaken conflict between member states. It would also create a consistent global standard for the safe and transparent activation of AI in international nuclear governance.

Questions to Consider

- a. Which stage within a nuclear decision requires human intervention from an ethical view?
- b. How can Member States mitigate the technical imbalance between developed nations and developing nations?
- c. Who should be held responsible if an AI system provided a false cue that led to a diplomatic crisis?
- d. Who will fund and execute the training of nuclear inspectors to understand and work alongside the AI system?
- e. What are the possible consequences for a state that used AI-driven technology that caused a diplomatic crisis?
- f. Are there any treaties that will be used or created?