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Autonomous Systems, Artificial Intelligence and Safeguards

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This study explores the mission space and key safeguards challenges confronting the International Atomic Energy Agency (IAEA) today and how autonomous technologies, e.g. technologies used by systems that are capable of learning and examining, then taking action based on what has been learned, may impact the status quo. Principle issues include the operational value of these systems to safeguards, risks and challenges of deployment (e.g., trustworthiness, security, transparency, explainability), and the likelihood of adoption in the near- to medium term (2-10 years)). We establish a set of criteria to identify autonomous systems and technologies that could impact IAEA safeguards verification activities in the next decade. The criteria are informed by specific safeguards outcomes the IAEA wants to achieve e.g., efficiency, maintaining continuity of knowledge (CoK) on nuclear materials, or identifying anomalies in large amounts of data. We develop and assess an inventory of existing and emerging commercial autonomous systems and their underlying technologies based on these criteria. In so doing, we leverage a Sandia-developed framework that considers four dimensions of autonomy: 1) levels of autonomy (e.g., the amount of human input or control in the system); 2) the operating environment (e.g., inspections, information analysis, sample collection); 3) autonomous technology functions (e.g., sensing, reasoning and learning, planning and controlling, acting and communicating); and 4) autonomous system technologies (e.g., systems for knowledge representation, storage, and retrieval; software for learning about and adapting to the environment; information collection for spatial/scene recognition and environmental sensing). Use cases identifying scenarios in which the selected technologies could be deployed inform the potential application space of the autonomous and AI systems, and serve as the foundation for analyzing impact. Finally, an evaluation of two specific technologies assess how they might benefit or challenge IAEA safeguards activities.

Which "Key Question" does your Abstract address?

TEC3.1

Which alternative "Key Question" does your Abstract address? (if any)

TEC3.4

Topics

TEC3

Primary author: HADDAL, Risa (Sandia National Laboratories)

Co-authors: Dr HAYDEN, Nancy (Sandia National Laboratories); Mrs FRAZAR, Sarah (Pacific Northwest National Laboratory)

Presenter: HADDAL, Risa (Sandia National Laboratories)

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