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Computational Methods for Physical Model Information Management: Opening the Aperture

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The volume, velocity and diversity of data available to analysts are growing exponentially, increasing the demands on analysts to stay abreast of developments in their areas of investigation. In parallel to the growth in data, technologies have been developed to efficiently process, store, and effectively extract information suitable for the development of a knowledge base capable of supporting inferential (decision logic) reasoning over semantic spaces. These technologies and methodologies, in effect, allow for automated discovery and mapping of information to specific steps in the Physical Model (Safeguard's standard reference of the Nuclear Fuel Cycle).

This paper will describe and demonstrate an integrated service under development at the IAEA that utilizes machine learning techniques, computational natural language models, Bayesian methods and semantic/ontological reasoning capabilities to process large volumes of (streaming) information and associate relevant, discovered information to the appropriate process step in the Physical Model. The paper will detail how this capability will consume open source and controlled information sources and be integrated with other capabilities within the analysis environment, and provide the basis for a semantic knowledge base suitable for hosting future mission focused applications.

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