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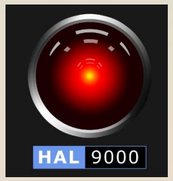
2024: Applications of Artificial Intelligence (AI) in Radiation Protection

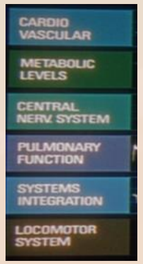


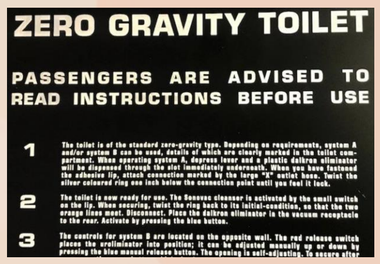
What does AI and HAL in "*2001*" have in common?

- Machine learning and deep learning, which enable AI/HAL to learn from data and improve its performance over time.
- Natural language processing, which enables AI/HAL to understand, generate natural language, communicate with humans.
- Robotics, which enables AI/HAL to perform certain physical tasks and interact with the environment.
- Computer vision, which enables it to perceive and interpret visual information.
- Planning and decision making, which enables it to achieve goals and solve problems.
- Knowledge representation and reasoning, which enables it to store and manipulate knowledge and draw logical conclusions.
- Intelligent agents, which are AI/HAL's subsystems that can perceive their environment and act upon it.
- Sensors and actuators, which are devices that enable HAL to sense and affect the environment.
- Risks to humans when AI/HAL is faulty and unreliable.

[Source: "*2001: A Space Odyssey*"]

Elements in HAL "*2001*" and potential AI technologies have in common, as related to protection of workers





- Real-time dosimetry, dose assessment, stochastic-risk analyses
- Computer simulations including work simulations of high radiation for ALARA planning activities
- Processes including radiation exposure with algorithms
- Monitoring health and safety in workplaces
- Analyzing real-time radiological data across machines to enable faster response time and more efficient in optimizing radiation protection of workers
- Planning and training of workers to reduce risk
- Real-time monitoring of instrument readouts
- Robotics to perform hazardous activities
- Monitoring and operating nuclear power systems
- Operating equipment to support life functions

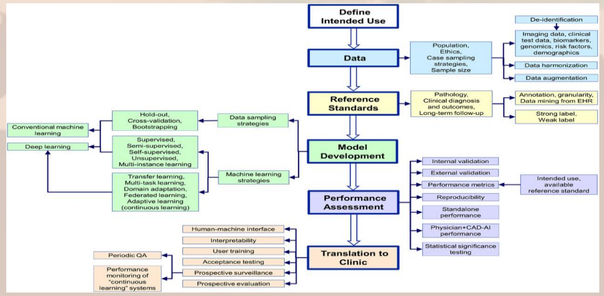
[Modified from source: Filip Vanhavere, István Szőke, Burçin Okyar, "2021 Technical Meeting on Artificial Intelligence for Nuclear Technology and Applications #AI4 Atoms Virtual Event"**]**

2024: Examples of AI Implementation

- As of 2024, FDA has approved more than 882 market-cleared AI medical algorithms. The majority of the AI software as medical device (SaMD) is related to medical imaging. [Source: www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-aiml-enabled-medical-devices]

- By combining digital simulations of actual nuclear facilities with AI systems, the industry can optimize complex procedures and improve reactor design, performance and safety. Such optimization can increase the efficiency of operations and reduce maintenance costs. [Source: www.iaea.org/newscenter/news/seven-ways-ai-will-change-nuclear-science-and-technology]

- AAPM Task Group Report 273 (Best practices for AI and machine learning for computer-aided diagnosis in medical imaging): Overview of AI/computer-aided diagnosis applications



[Source: aapm.onlinelibrary.wiley.com/doi/10.1002/mp.16188]