

ARTIFICIAL INTELLIGENCE/MACHINE LEARNING TECHNOLOGIES FOR ADVANCED REACTORS VIRTUAL WORKSHOP



PURPOSE, OBJECTIVE, AGENDA



RICK VILIM
Nuclear Science and Engineering Division
Argonne National Laboratory

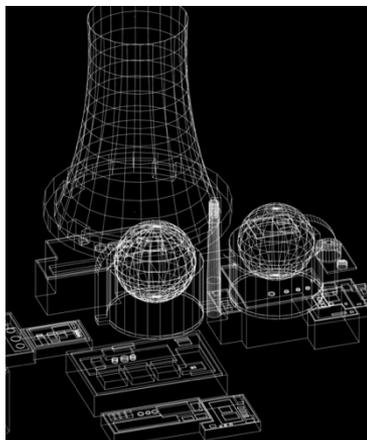


PURPOSE

Identify the most promising AI/ML opportunities

for improving advanced reactor design, optimizing plant performance, and enhancing economic competitiveness

Asking industry: What are your development needs and AI/ML application interests?



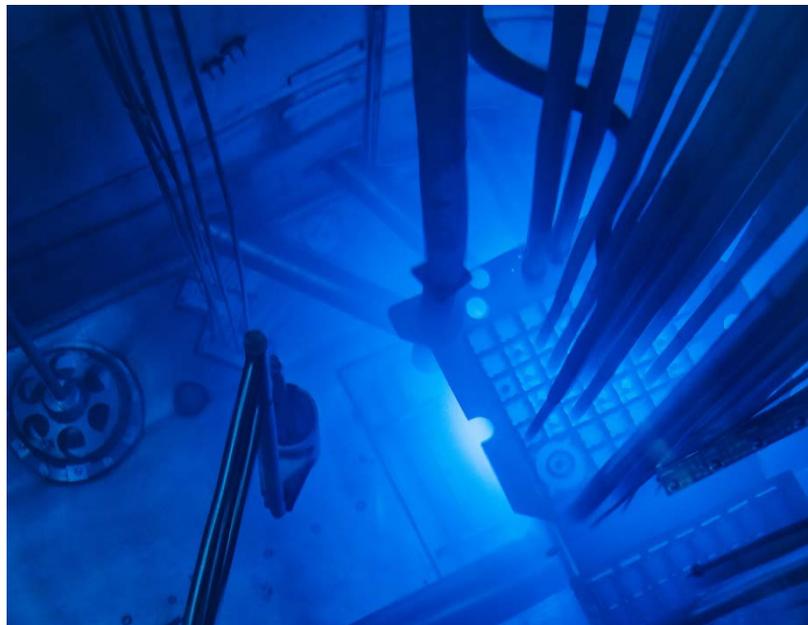
OBJECTIVE

Focus on Advanced Reactors, informed by current LWR efforts

Focus on engineering challenges within the advanced reactor industry that cannot be solved with conventional modeling and analysis methods.

Help shape the development of AI/ML technologies tailored to the industry needs.

Exemplify what is achievable for advanced reactors by describing some LWR applications and lessons learned.



WHAT IS AI/ML?

Artificial Intelligence (AI):

Any system that perceives its environment and takes actions that maximize its chance of achieving its goals

Note: Machine Learning (ML) falls under AI

Elements of an AI System

ELEMENT	EXAMPLE OF REALIZATION
Perception	Interpreter of extracted features
Machine Learning	Neural Network
Knowledge Representation	Rule-based system
Reasoning	Inferential logic
Planning	Markov processes

Each element above will appear in presentations over the course of this workshop

WHY AI/ML NOW?

A confluence of...

- Dramatic increase in computational power
- Advanced software development environments
- More capable and less costly sensors
- New communication technologies (fiber, acoustic, microwave) enable richer data acquisition and aggregation
- High fidelity modeling and simulation tools

That can potentially enable...

new methods of algorithmic data processing not possible a decade ago

Strongly motivated by...

economic competitiveness pressures to exploit new methods to solve previously intractable problems

ISSUES TO BE EXAMINED

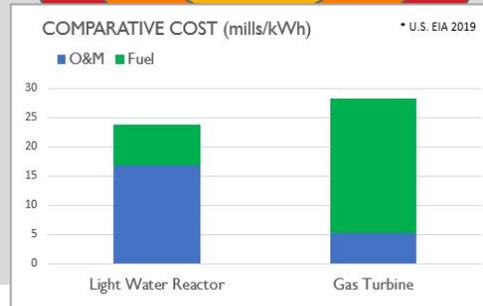
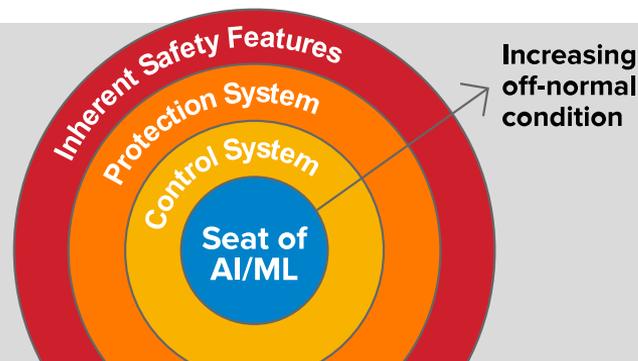
Through presentations and discussion

Does AI/ML represent a viable technology for addressing challenges faced by AR developers and by current LWR fleet?

If no Advanced Reactors are operating in the US, how can one do AI/ML without plant data?

If tasks now performed by humans are turned over to a machine, what are their safety issues and if so, how might they be mitigated?

What AI/ML topics would you like to see featured in future workshops?



Argonne
NATIONAL LABORATORY

