VIRGINIA TECH™

Hume Center for National Security and Technology

Problematic AI Panel:

What is AI, how is it used and how can it produce erroneous results?

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[Incomplete] Artificial Intelligence Taxonomy

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Reasoning

Programmed

- Planning/Logic/Expert Systems
- Optimization
- Agent-Based Systems

Learning

Supervised

- Bayesian Networks
- Regression
- Neural Networks

Reinforcement

- Genetic Algorithms
- Markov Decision Processes

Unsupervised

- Clustering
- Principal Component Analysis

Deep Learning

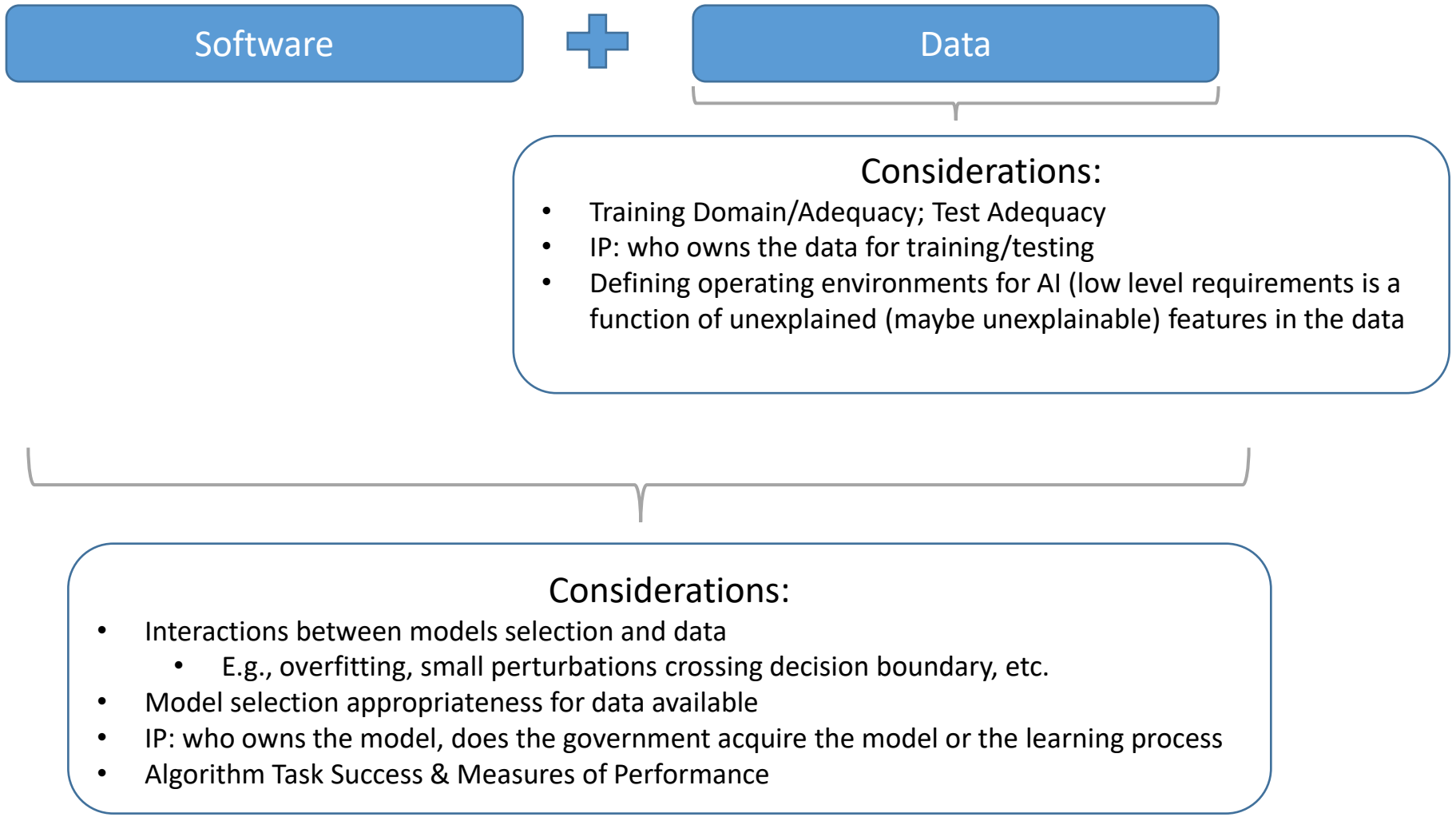
- Convolutional Neural Networks
- Recurrent Neural Networks
- Deep Q Learning
- Autoencoders
- Generative Adversarial Nets

Select National Priorities in AI Research

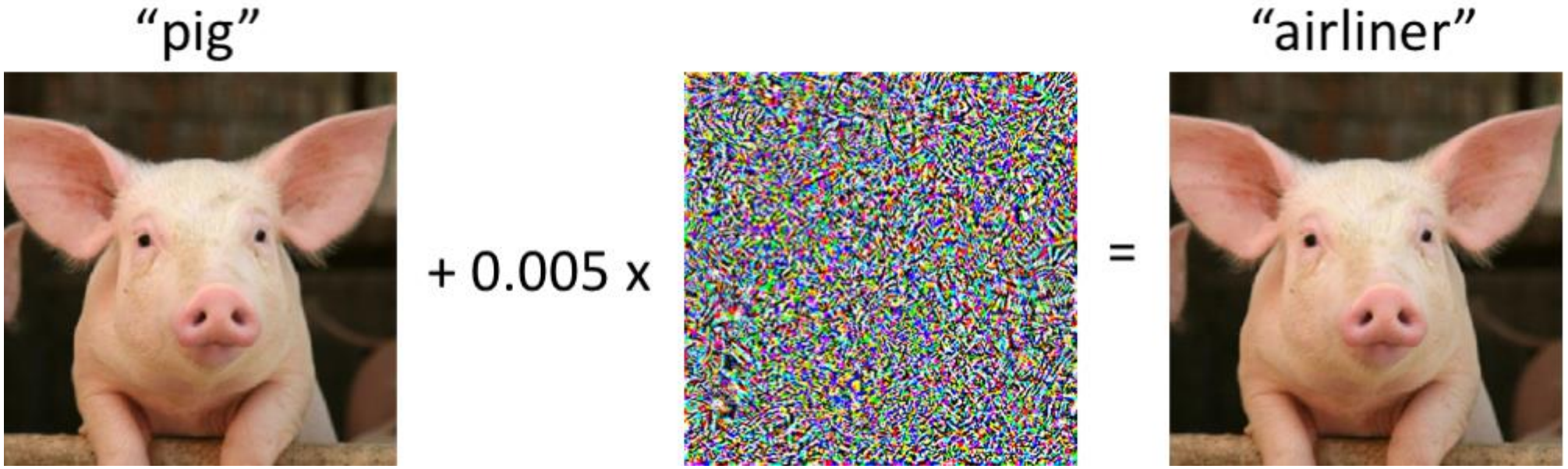
	Office of Scientific and Technical Information - Department of Energy	Department of Defense	National Institute of Standards and Technology
Fundamental / Foundational	Accelerating research insights	"adopt AI principles that reflect our nation's values of a free and open society"	Theme: Measure and enhance the trustworthiness of AI Systems
	Domain Aware	1) Responsible	Secure
		2) Equitable	Objective/Accurate
	Interpretability	3) Traceable	Explainable
	Robustness	4) Reliable	Reliable/Robust
		5) Governable	
Applied / Capability	Scientific data analysis	Key Missions – Situational Awareness, Safety, etc.	Revolutionizing metrology at NIST from experiment design to research results
	Enhance modeling and simulation		
	Management & control of complex systems	Complex System Acquisition	

Current Wave of AI – Software + Data

- Statistical Learning Based Machine Learning and Artificial Intelligence

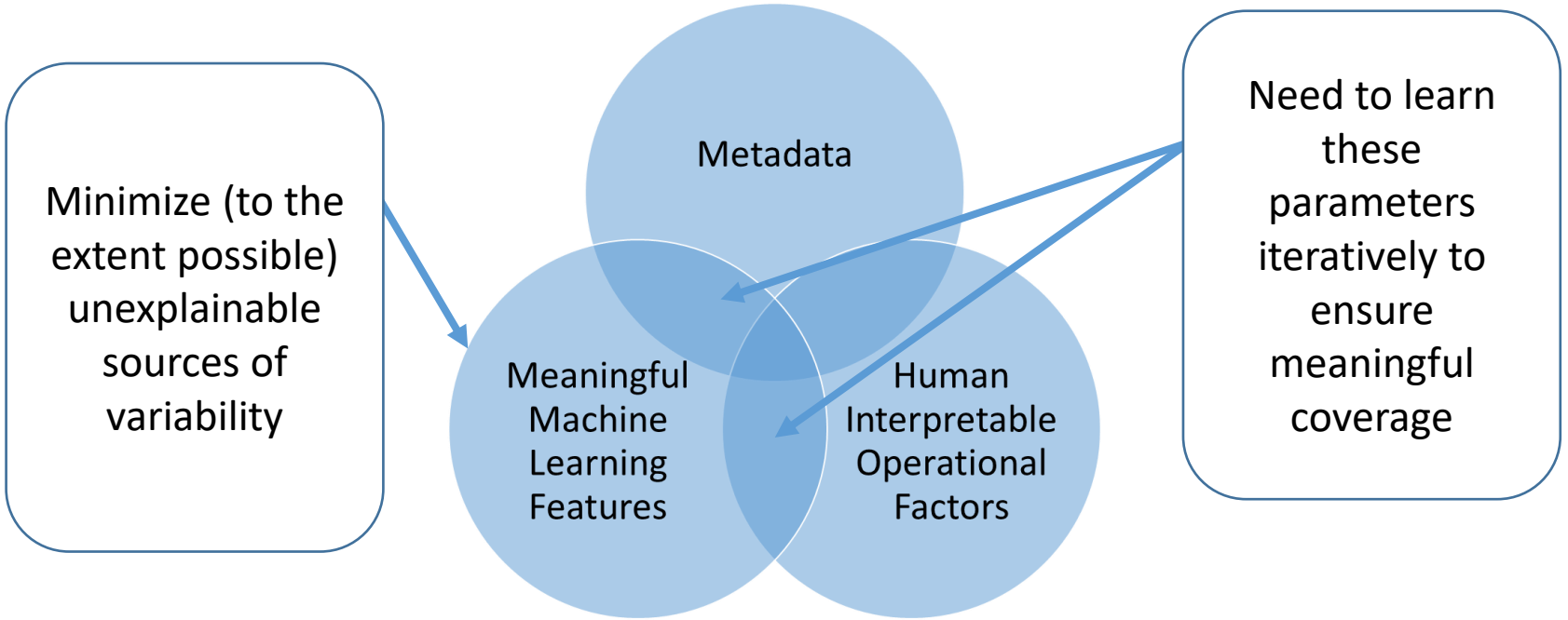


What I am not going to focus on!



Challenge 1: Operating Domains & Explainable AI

- Data defines the operating envelope for an AI-enabled systems
- Humans have to make decisions on when and where to deploy AI



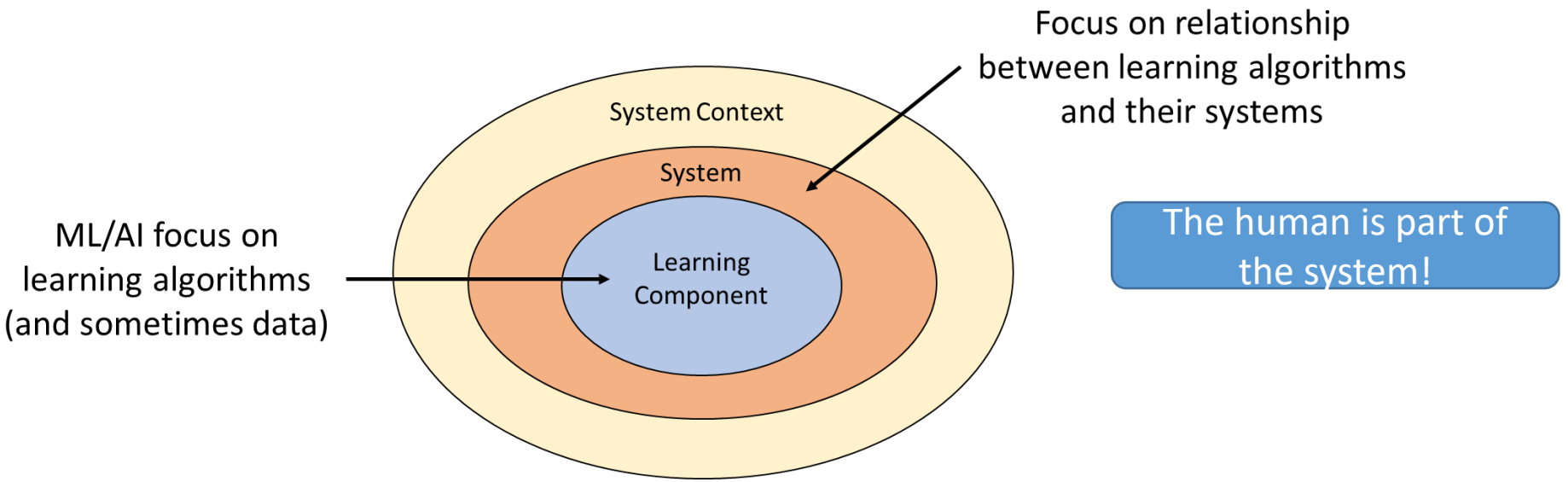
Erroneous results occur when there is a mismatch between what the algorithm is learning and what the human thinks the algorithm is learning.

Challenge 2: Human-System-AI Interactions

Observation

Artificial Intelligence (AI) and engineered systems are **coupled**

Reliability, V&V, prognostics, etc. for AI
cannot be divorced from system (including the human)



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