

Joint Review: AI Whitepaper

AI Safety Culture, Quality Assurance, and Contractor Assurance Use Cases, Precautions, Limitations, and Recommendations

EFCOG 2024 Fall Meeting



Cahley Jaekel

Performance Analyst
Pacific Northwest National Laboratory



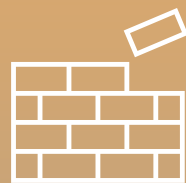
PNNL is operated by Battelle for the U.S. Department of Energy



Whitepaper Overview

Development

Joint project by the EFCOG Safety Culture CoP and Software Quality Assurance CoP



Purpose

Snapshot of AI applications, best practices, precautions, limitations, and potential use cases



Contributors

Central Plateau Closure Company, Consolidated Nuclear Security, FBP, HMIS, INL, NNSA, NREL, Palantir, PNNL



Leads

Adrienne King
Cristy Renner



What is Artificial Intelligence (AI)?

Definition

An agent that imitates intelligent human behavior to perform cognitive tasks.



Capabilities

- Learning
- Reasoning
- Problem-solving
- Adaptive
- Flexible



Key features

- No rule-based systems
- Autonomous
- Continuously improves

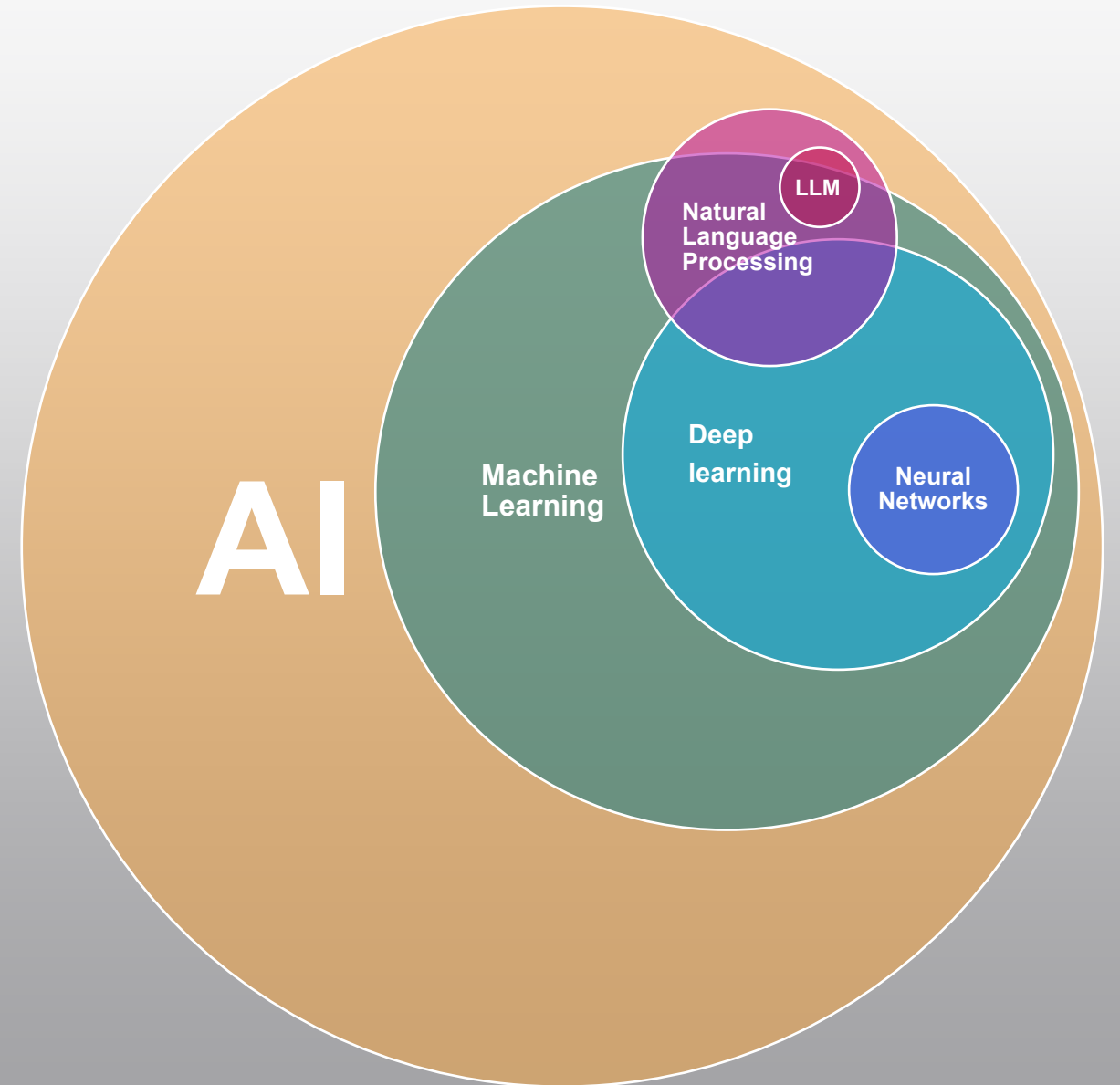
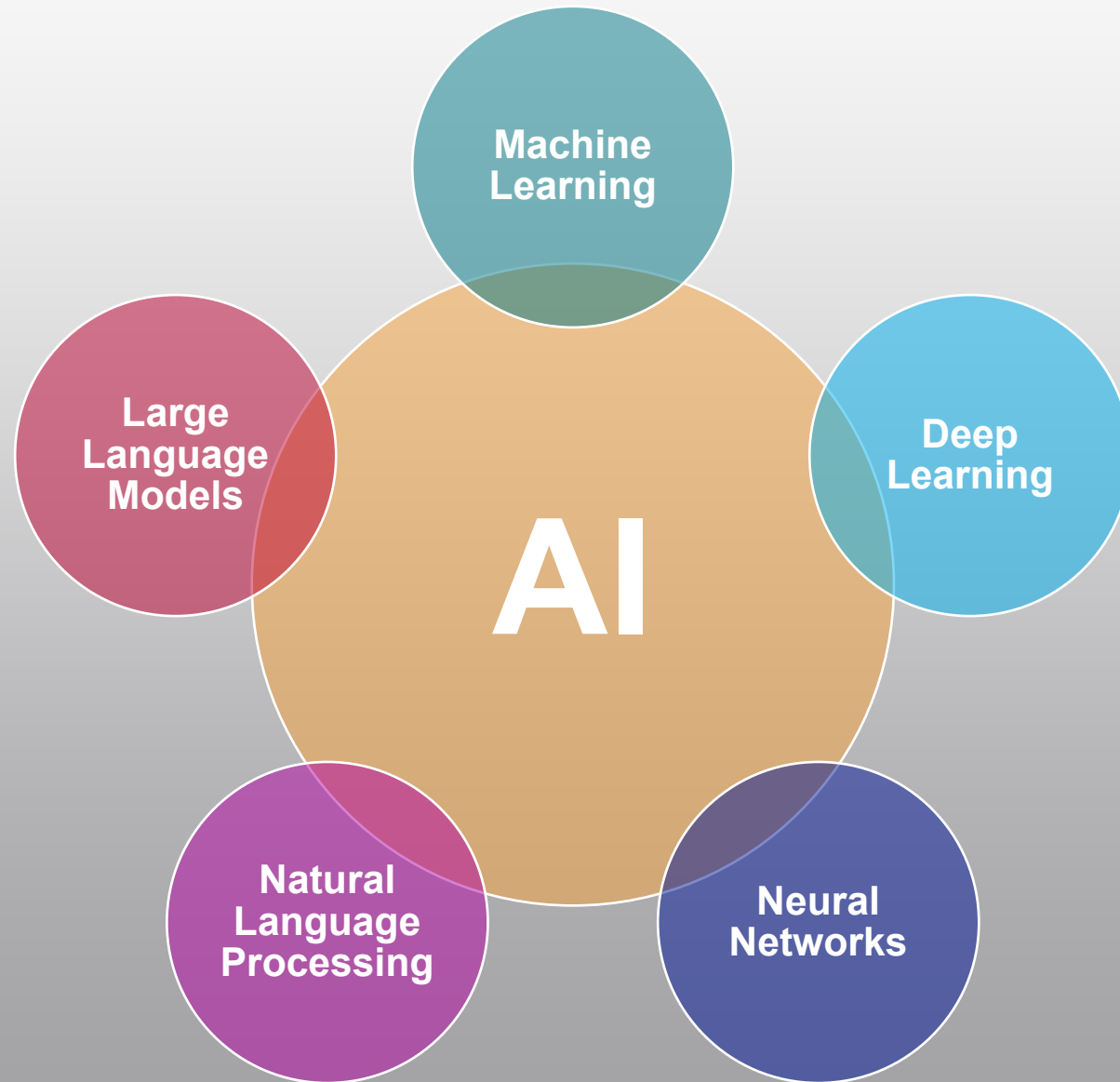


Techniques

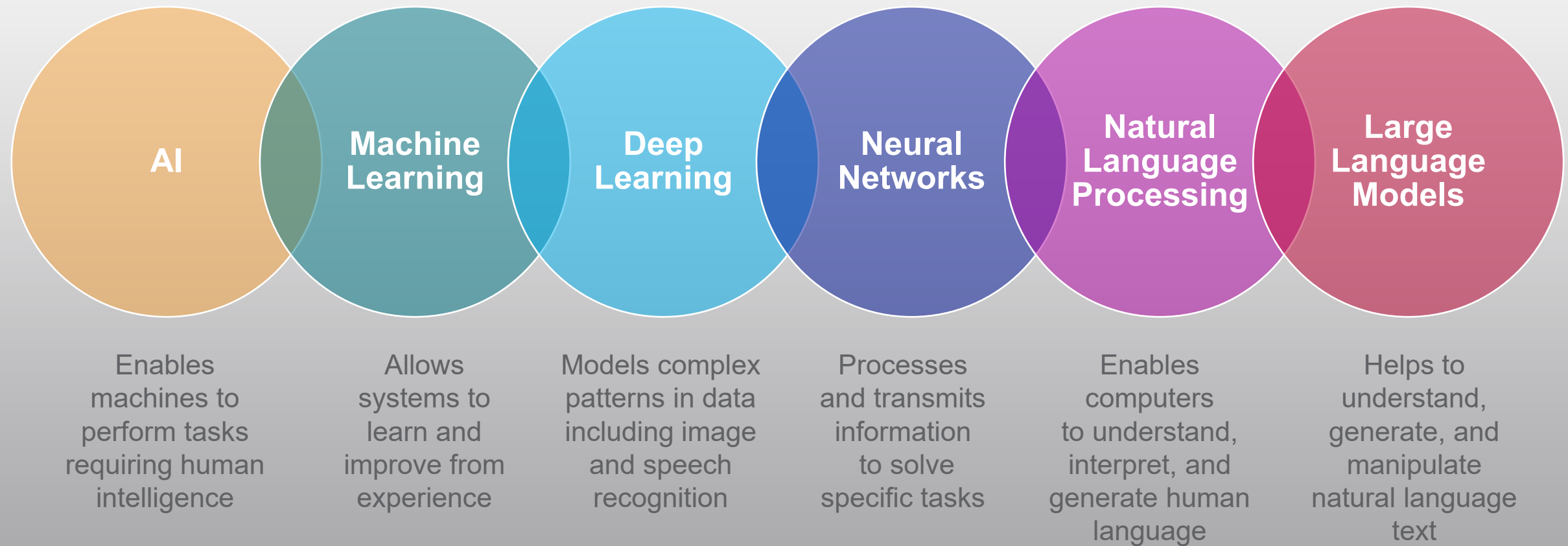
- Machine learning
- Deep learning
- NLP
- LLM
- Neural networks



AI Components & Functions



AI Components & Functions



Precautions & Limitations

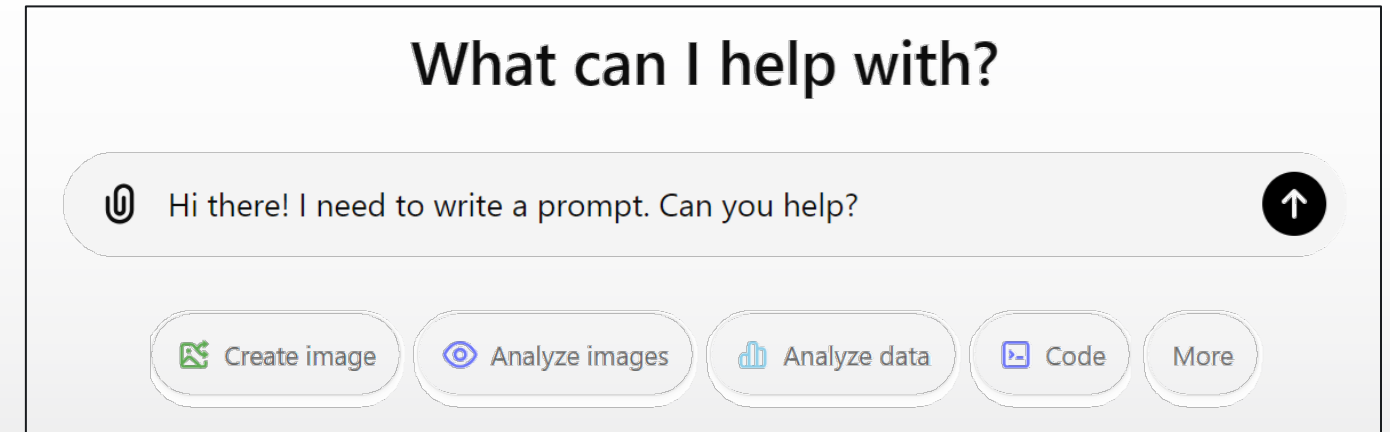
General Considerations

- Understand usage restrictions
- Handle sensitive information cautiously
- Monitor human behavior effects
- Independent review required

Specific Considerations

- Software quality assurance
- Enterprise data management
- Data usage and compliance

Prompt Engineering



General Considerations

- Be specific and clear with your prompt
- Consider ethical implications and data privacy
- Regularly validate and review AI outputs
- Structure inputs and outputs effectively
- Break down complex tasks into smaller steps
- Provide examples of desired responses
- Use prompt AI tools to improve prompts

Role of AI and its Benefits at DOE Sites



Current AI Use Cases

Contractor	Use Case	Description	Tool	Goal
ANL	Lessons Learned Draft Generation	AI generates initial drafts of lessons based on ORPS events	Argo	Speed up lesson draft creation
ANL	Work Planning and Control Lessons	AI pulls in relevant lessons learned for work planning	Aware	Save time for work planners.
HMIS	Hanford Service Catalog Search	AI bot simplifies ticketing system navigation	HAL Program	Simplify and enhance ticketing process
HMIS	Hanford Popfon Search	AI bot finds employee contact information	HAL Program	Simplify contact info retrieval
HMIS	Hanford Procedure System Search	AI bot searches procedure documents by criteria like keywords	HAL Program	Simplify document search
INL	DOE OPEXShare Lessons Analysis	AI improves search efficiency for operating experience knowledge	SimSearch	Enhance work planning efficiency
NNSA	AIP Librarian	AI navigates and queries public documents	AIP Librarian	Empower self-guided learning
NNSA	AI-enabled Workflows	AI supports document summarization and search	SAFER	Facilitate document navigation
NNSA	Facility Fuzzy Matching	AI handles facility references with metadata issues	Facility Matching	Improve facility-reference linkages
NNSA	ORPS Key Takeaways	AI summarizes ORPS reports	AIP	Streamline key information retrieval
NREL	People Planning Chatbot	AI assistant for planning and internal proposals	Solaire	Save time and increase accuracy
PNNL	Policy AI	AI synthesizes NEPA review data	PolicyAI	Streamline reviews
PNNL	Survey Comments Analysis	AI analyzes survey feedback to identify themes and sentiment	PNNL AI Incubator	Enhance thematic analysis
SNL	Fire Operational Efficiencies	AI aids Fire Protection tasks	AIP Logic	Enhance task efficiency

Future AI Use Cases

- Analyzing trends and linking significant events
- Providing specific information and simplifying communication
- Automating the creation of documentation
- Enhancing search capabilities for multimedia content
- Reliable analysis for better planning and performance

Have a current or future use cases you want to share?



[Click or scan the QR code above to provide your input](#)





**Pacific
Northwest**
NATIONAL LABORATORY

Cahley Jaekel

PERFORMANCE ANALYST

Phone: 509-375-2089

cahley@pnnl.gov

902 Battelle Boulevard

P.O. Box 999

Richland, WA 99352

www.pnnl.gov

Acronyms

- **AI:** Artificial Intelligence
- **ANL:** Argonne National Laboratory
- **CPCCC:** Central Plateau Closure Co.
- **CNS:** Consolidated Nuclear Security
- **DOE:** Department of Energy
- **FBP:** Fluor-BWXT Portsmouth
- **HMIS:** Hanford Mission Integration Services
- **INL:** Idaho National Laboratory
- **LLM:** Large Language Model
- **ML:** Machine Learning
- **NLP:** Natural Language Processing
- **NNSA:** National Nuclear Security Administration
- **NREL:** National Renewable Energy Laboratory
- **ORPS:** Occurrence Reporting and Processing System
- **PII:** Personally Identifiable Information
- **PNNL:** Pacific Northwest National Laboratory
- **RAG:** Retrieval-Augmented Generation
- **SNL:** Sandia National Laboratories