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WARGAMING AND AI: IS THE INTEGRATION POSSIBLE?

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Agenda

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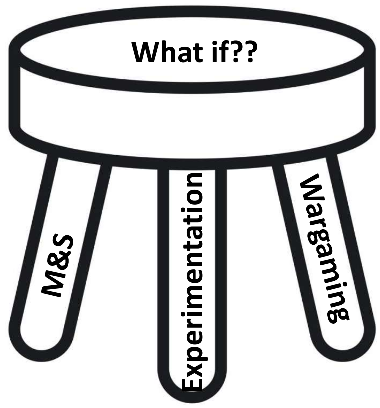
Some definitions

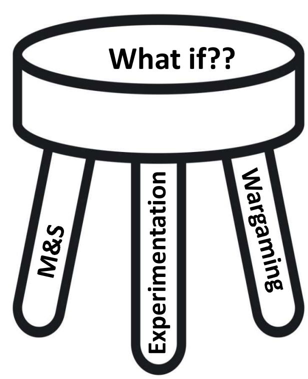


… definitions

Modeling & Simulation: Used extensively in defense, supporting concept exploration, acquisition, doctrine development, and training (by repeating a model). Focus on modeling real-world systems or scenario to study its behavior and outcomes.

Experimentation: Critical for refining military strategies, divided into discovery, hypothesis testing, and demonstration experiments.

Wargaming: Explores human decision-making in military conflicts through various formats (tabletop exercises, deductive/inductive games, scenario-based games).



… more definitions

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Wargame definition (1): '(Adversarial by nature), a wargame is a warfare model or simulation, using rules, data, and procedures, not involving actual military forces, and in which the flow of events is affected by, and in turn affects, decisions made during the course of those events by players representing the opposite sides.'

Peter Perla. The Art of Wargaming, Naval Institute Press, 1990.

Wargame definition (2): A simulation, by whatever means, of a military operation involving two or more opposing forces, using rules, data, and procedures designed to depict an actual or assumed real life situation.

US Joint Publication 1, 2013

Wargame definition (3): "A simulation of a military operation in which participants seek to achieve a specified objective, given pre-established resources and constraints",

AAP-6, 2021

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Wargame types

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1. **Decision-Support Wargames**: Used to assist military leaders in making strategic and operational decisions. Helps evaluate different courses of action before real-world implementation.
2. **Analytical/Research Wargames**: Designed to study military concepts, tactics, and emerging threats. Often used in defense planning and policy development.
3. **Training/Education Wargames**: Focused on improving the skills of military personnel. Includes tactical exercises and leadership development scenarios.
4. **Capabilities & Force Development Wargames**: Used to test new military technologies, force structures, and operational concepts. Helps refine military doctrine and future capabilities.

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… more Wargame types

5. **Tactical Exercises Without Troops (TEWT)**: Conducted without actual forces on the ground. Used to train officers in battlefield decision-making.
6. **Command Post Exercises (CPX)**: Simulates command and control operations in a realistic setting. Helps military leaders practice coordination and communication.
7. **Seminar Wargames**: Discussion-based exercises where experts analyze military scenarios. Used for policy development and strategic planning.
8. **Matrix Games**: A structured approach where players propose actions and outcomes are adjudicated. Encourages creative thinking and problem-solving.
9. **Red Teaming**: <u>Involves an adversarial team simulating enemy tactics to challenge assumptions. Helps identify vulnerabilities and improve military strategies.</u>

Roles and Phases

1. <u>Game Sponsor</u>
2. <u>Game director</u>
3. <u>Wargame team:</u>
   - Sponsor representative
   - Designer
   - Analysts
   - SME's
   - Game Controller
4. <u>Players</u>:
   - Blue
   - Red
   - Orange
   - Black
   - Green

1. Discover (Preparation & Commissioning)
•Define the aim, purpose, and objectives of the wargame.
•Establish the timescale, required level of assurance, and expected outcomes.
•Identify key stakeholders, participants, and resources.
•Develop an initial concept for the wargame structure.
2. Design (Scenario & Mechanics Development)
•Construct the wargame scenario, including setting, actors, and rules.
•Develop the game mechanics, including adjudication methods and decision-making processes.
•Conduct iterative playtesting to refine mechanics and ensure realism.
•Finalize physical materials, digital tools, and briefing documents.
3. Deliver (Execution & Data Collection)
•Rehearse the wargame to ensure smooth execution.
•Conduct the main gameplay session, collecting data on player decisions and interactions.
•Facilitate real-time adjudication and scenario progression.
•Ensure structured documentation of key insights and observations.
4. Analyse (Post-Wargame Review & Reporting)
•Conduct an After-Action Review (AAR) to assess outcomes.
5. Deliver Report

Characteristics

1. Competitive & Adversarial
- Involves opposing forces or teams simulating real-world conflicts.
- Encourages strategic thinking and decision-making under pressure.

2. Scenario-Based
- Built around **historical, hypothetical, or futuristic** military scenarios.
- Allows participants to explore different courses of action.

3. Decision-Centric
- Focuses on **command and control** decision-making.
- Helps military leaders refine their **strategic and tactical choices**.

4. Rule-Governed
- Operates within a structured framework of **rules, constraints, and adjudication mechanisms**.
- Ensures fairness and consistency in outcomes.

5. Iterative & Adaptive
- Players can adjust strategies based on **new information and evolving conditions**.
- Encourages **learning from mistakes and refining tactics**.

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Characteristics

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6. Multi-Domain Integration
- Covers **land, air, sea, space, and cyber warfare**.
- Helps military planners understand **cross-domain interactions**.

7. Analytical & Insight-Driven
- Generates **data and insights** for refining military doctrines.
- Used for **policy development, force structure assessment, and operational planning**.

8. Realism & Simulation
- Uses **real-world constraints** like logistics, terrain, and intelligence.
- Can incorporate **AI-driven adversaries and predictive analytics**.

9. Educational & Experiential
- Helps participants **develop leadership skills and strategic thinking**.
- Used in **military academies, defense organizations, and research institutions**.

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Wargaming today

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https://youtu.be/DIW3HUYwU3Y

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Definitions again

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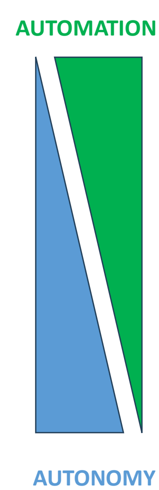
AI Types

Artificial Narrow Intelligence (ANI) – Also known as Weak AI, this type is designed for <u>specific tasks</u>. Examples include chatbots, recommendation systems, and voice assistants like Siri and Alexa.

Artificial General Intelligence (AGI) – Also called Strong AI, this theoretical AI would have <u>human-like intelligence</u>, capable of reasoning, learning, and adapting across different domains.

Artificial Superintelligence (ASI) – A hypothetical AI that <u>surpasses human intelligence</u> in all aspects, including creativity, problem-solving, and emotional intelligence.



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AI and Wargame integration (sort of…)

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AI in the Military:
- DARPA AlphaDogFight, 2020: Human vs AI (0-5)
- PLA: AI beats Human controlled Fighter in 60'' (2023)
- The Navy's New Drone Swarm Heralds a Future of Autonomous Warfare

JWARS:
- JWARS is a campaign-level military simulation developed by MITRE for the Office of the Secretary of Defense (OSD).
- It aims to support operational planning, force assessment, system trade analyses, and doctrine development.
- The model provides a balanced representation of joint warfare, integrating C4ISR, logistics, and maneuver warfare.

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JWARS Issues and Limitations

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1. Algorithm Consistency

While JWARS incorporates validated algorithms from different military domains, there may be inconsistencies between them. For example, assumptions in indirect fire modeling may not align with those in air-to-ground attrition calculations, which could affect the overall balance of the simulation.

2. Data Challenges

JWARS requires extensive data to build realistic scenarios. However, ensuring cross-domain consistency in data and integrating it effectively with environmental factors remains a challenge. Additionally, acquiring and managing the necessary data demands significant resources.

3.Complexity & Learning Curve

As a highly detailed model, JWARS comes with a steep learning curve. Developing a proficient team of analysts and generating reliable end-to-end results for senior leaders will take time.

4. Resource Demands

- The system requires **significant computational power** and **data management resources**.
- Meeting these demands will require **continuous investment** in infrastructure and personnel.

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WARGAMING Issues and Limitations

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… Unfortunately, modern wargames run by and for the U.S. government tend to be expensive, opaque, and prone to hyperbole. There is no clear, transparent accounting for the costs associated with running an analytical wargame, with costs for typical games ranging from hundreds of thousands to millions of dollars. If that picture is not bleak enough, according to a 2023 Government Accountability Office (GAO) study, there "are barriers to accessing wargame data, information on upcoming wargames is not shared, and the services have not developed standard education and qualifications for wargamers."

It Is Time to Democratize Wargaming Using Generative AI – Centre for Strategic & International Studies

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AI Hype

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Role emulation: Analysts can train models using fine-tuned datasets to represent different stakeholders. Use generative AI and LLMs to create game agents.

"Worlding": create multiple worlds using a mix of generative images and text at low costs.

Decision Support: AI can analyze vast amounts of data to provide actionable insights, helping military leaders make informed decisions quickly.

Scenario Simulation: AI can create realistic simulations that account for various variables, allowing for more comprehensive training and preparation.

Data Analytics: Advanced data analytics techniques can be employed to assess the effectiveness of different strategies and predict potential outcomes.

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Application of AI in Wargaming

•**Game Design:** AI can generate scenarios, adversarial strategies, and procedural content to enhance realism.

•**Game Execution:** AI could adjudicate battles, simulate opponent responses, and assist with tactical decision-making.

•**Game Analysis:** AI-driven analytics can highlight critical player interactions, conduct behavioral assessments, and combine wargame data with external intelligence.

•**Game Logistics:** AI might streamline administrative tasks, transcribe discussions, and provide real-time language translation.

More AI integration Project

- **Group W's BrainSTORM**: A system designed to assist in scenario generation and adversarial strategy development.
- **DARPA's Gamebreaker AI**: Uses AI to analyze game mechanics and identify vulnerabilities in strategic simulations.
- **DARPA's SHADE Project**: Focuses on AI-driven arbitration and diplomatic engagement in conflict resolution scenarios.
- **DARPA'S COMBAT**: programme aimed to develop AI applications which could model red team behaviour and be used to challenge blue teams in subsequent war games.
- **DARPA'S SCEPTER**: project using automation and AI to explore the development of novel course of action plans at machine speed.

More AI integration Project LL

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Gamebreaker AI	• Indicative of possibility of learning from commercial games industry successes, rather than starting from scratch for defence applications. • Highly quantified approach may be applicable to tactical games or games with a pre-determined rulebook. Unclear whether this is applicable to strategic wargames with high uncertainty.
BrainSTORM	• Early experiments show users, even non-experts, prefer to interpret AI recommendations themselves rather than adopting them wholesale.
SHADE	• Indicates efforts are being made to understand how AI agents might deal with human concerns at the more strategic end of the spectrum – for example, deceptive human behaviors. • Demonstrates the exploratory nature of much existing work, with the aim being to develop a prototype AI agent rather than a near-term capability.
DARPA COMBAT	• Illustrates benefits of competitive research models to drive innovative ideas within private sector. • Unclear if this project demonstrates a successful application of AI red team agents given the lack of public evidence of which AI methodologies were applied or what results were achieved.
DARPA SCEPTER	• This project is at an early stage and further developments should be tracked for further insights.

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Technical Challenges and Requirements

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1 Development of a Valid Methodology
•AI in wargaming requires a **structured methodology** to ensure its outputs are reliable and meaningful.
•The challenge lies in **defining clear evaluation criteria** for AI-generated insights.
•AI models must be **tested rigorously** to confirm their effectiveness in decision-making scenarios.

2 Over-Trust in AI
•There is a risk that players and decision-makers may **over-rely on AI-generated recommendations**.
•AI models can produce **convincing but flawed** strategies, leading to **false confidence** in their outputs.
•**Human oversight** is essential to prevent blind trust in AI-driven adjudication.

3 Ensuring Trustworthiness
•AI systems must be **transparent and explainable** to gain user trust.
•There is a need for **verification and validation (V&V) procedures** to assess AI reliability.

4 Establishing Causality
•AI excels at **pattern recognition** but struggles with **causal reasoning**.
•Wargaming requires **cause-and-effect analysis**, which AI models often fail to provide.
•I**nvest in AI techniques that establish causality**, ensuring AI-driven insights are logically sound.

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Technical Challenges and Requirements

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5 AI with Contextual Awareness
•AI must **adapt to dynamic wargaming environments** rather than relying on static datasets.
•The challenge is ensuring AI understands **real-world complexities**, including **human decision-making nuances**.
•**Develop AI models that incorporate contextual factors**, improving their relevance in wargames.

6 Data and AI System Sovereignty
•AI-driven wargaming requires **secure data management** to prevent unauthorized access.
•There are concerns about **data sovereignty**, ensuring AI models remain under **national control**.
•AI systems must be **designed with security protocols** to protect sensitive wargaming data.

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Conclusions

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AI has potential as a tool to supplement some low-risk elements of wargaming, but introducing AI won't overcome the delays and costs often associated with wargaming. Introducing AI in wargaming itself may in fact introduce new costs, administrative delays, and uncertainty in outputs.

•**Deploy narrow AI applications** (e.g., procedural content generation, speech transcription) to improve efficiency.

•**Invest in research for high-risk AI applications** (e.g., AI-assisted adjudication, decision-making tools) while addressing technical and ethical challenges.

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