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PEGASIS

PROGRAM for EXPERIMENTAL GAMING & ANALYSIS of STRATEGIC INTERACTION SCENARIOS

PROJECT ON NUCLEAR GAMING

GRAND — GAMING RESEARCH for ALLIANCE NETWORK DYNAMICS

Experimental Wargaming and Emerging Military Capabilities in the NATO Context

PRESENTED BY

K. Lakkaraju, A. Reddie

Sandia National Laboratories

U.S. DEPARTMENT OF ENERGY

NNSA

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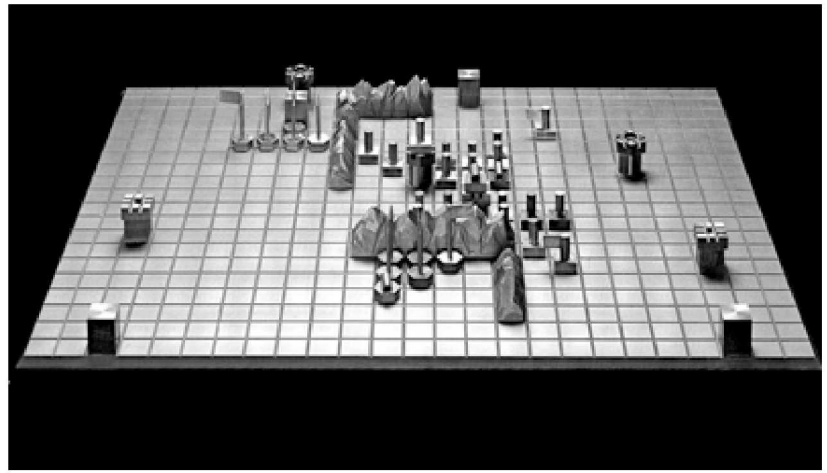
Research Question

Under what conditions might the development and deployment of emerging military capabilities alter the likelihood of conflict escalation?

Conflict Escalation in Context



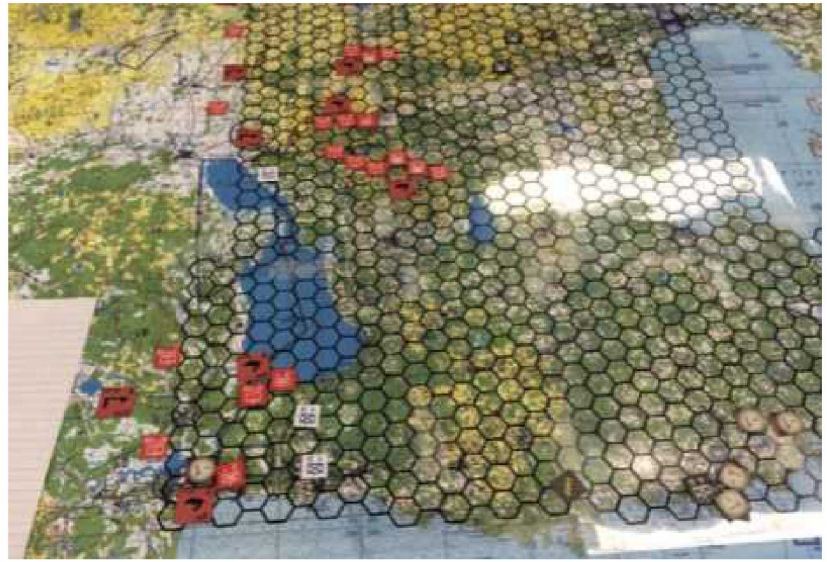
Under what conditions might the development and deployment of emerging military capabilities alter the likelihood of conflict escalation?

Traditional Explanations:

- Country-level characteristics:
  - Regime type
  - Alliances
  - Economic ties
- System-level characteristics:
  - Polarity
  - International organizations
- Technological explanations:
  - Nuclear latency
  - Nuclear cooperation agreements

Traditional Methods:

- Empirical Analysis
  - Case analysis
  - Large-*n*
- Formal Models
- Computer-based Models



Taking Behavior Seriously

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These approaches often miss the **behavioral** aspects of conflict escalation

- Are there scenarios in which conflict escalation is more or less likely?
- How might policy-maker attributes affect this likelihood?
- What behavioral factors might influence conflict escalation?

Towards an Experimental Wargaming Framework

To address both the behavioral and capability-based drivers of conflict escalation, we propose using an experimental wargaming approach (analog and digital) designed to capture player data for quantitative analysis:

- *Dependent variables*
  - Does the conflict escalate?
  - Are there identifiable (quantifiable) stages in the conflict escalation proces
  - What types of military capabilities are used during conflict escalation?
  - Do players escalate in response to others escalating?
- *Independent variables*
  - Latent conflict
  - Military capabilities
    - Of various types
  - Adversary strategies
  - Economic variables
  - Demographic variables
  - Player attributes

Experimental Wargames and Emerging Capabilities

There are a large number of “emerging” technologies that scholars and practitioners have suggested might affect strategic stability:

- Hypersonic missiles
- Artificial intelligence capabilities
  - C4ISR
  - Autonomy
- Cyber capabilities

But, there is no data with which to test these propositions…

Experimental Wargames and Emerging Capabilities

Experimental wargaming offers a data-generating process with which to test propositions surrounding these capabilities:

- A/B Testing
- Control-Treatment Design
- Use of experimental design principles
  - Replicability
    - To collect data from a large numbers of participants, we need to have a repeatable experiment.
  - Randomization
    - Participants must be assigned to random conditions.
  - Controllability
    - The game must be controllable to allow for systematic manipulation of the independent variable.
  - Instrumented
    - The game must allow for capturing player behaviors.
  - Neutrality
    - The game should not bias participant behavior with regards to the research question.

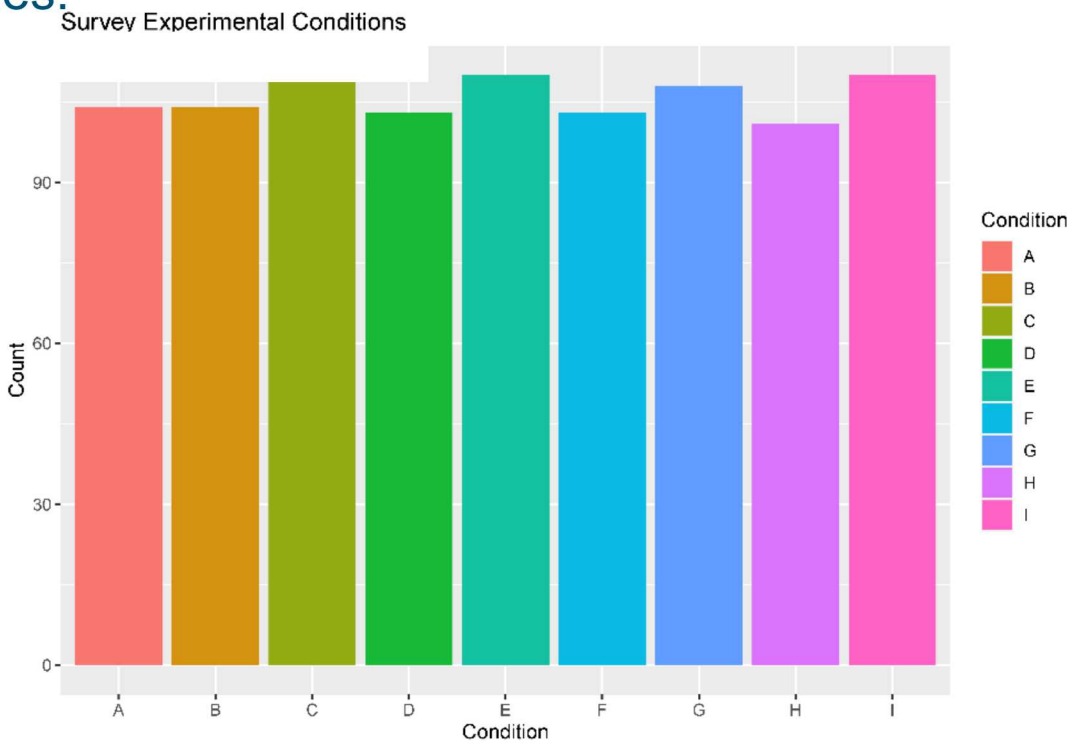


Table 13: This table shows the treatment conditions that take into account respondent and adversary capabilities.

		Adversary Capabilities		
		Tailored Weapons	*HY Nuclear Weapons*	*No Nuclear Weapons*
Respondent Capabilities	*Tailored Weapons*	A	E	D
	HY Nuclear Weapons	G	B	F
	No Nuclear Weapons	H	I	C

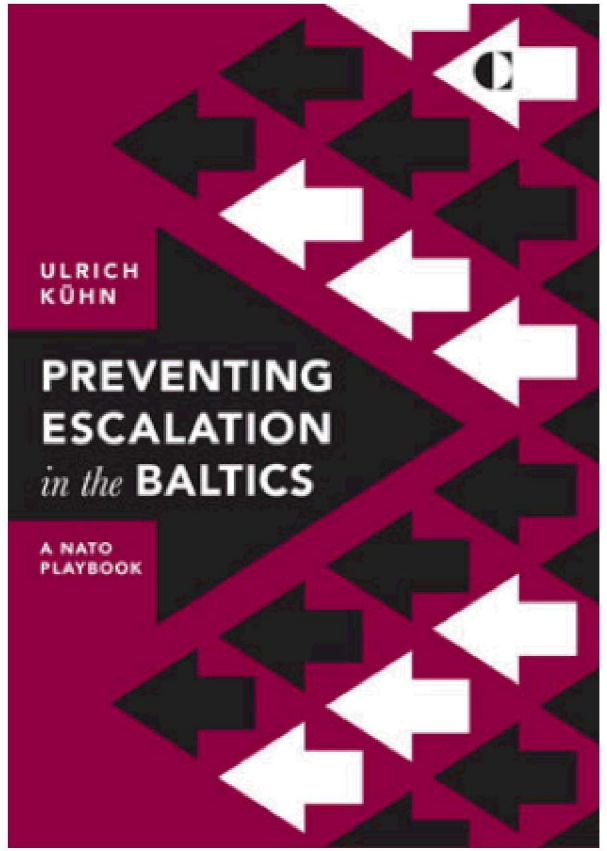
Experimental Wargames and Scenarios

Wargames can be operationalized to examine how relevant scenarios might affect NATO goals:

- Assurance
- Deterrence
- Resilience
- Risk reduction

The goal of the scenario is to hold these goals at risk or in tension with one another…

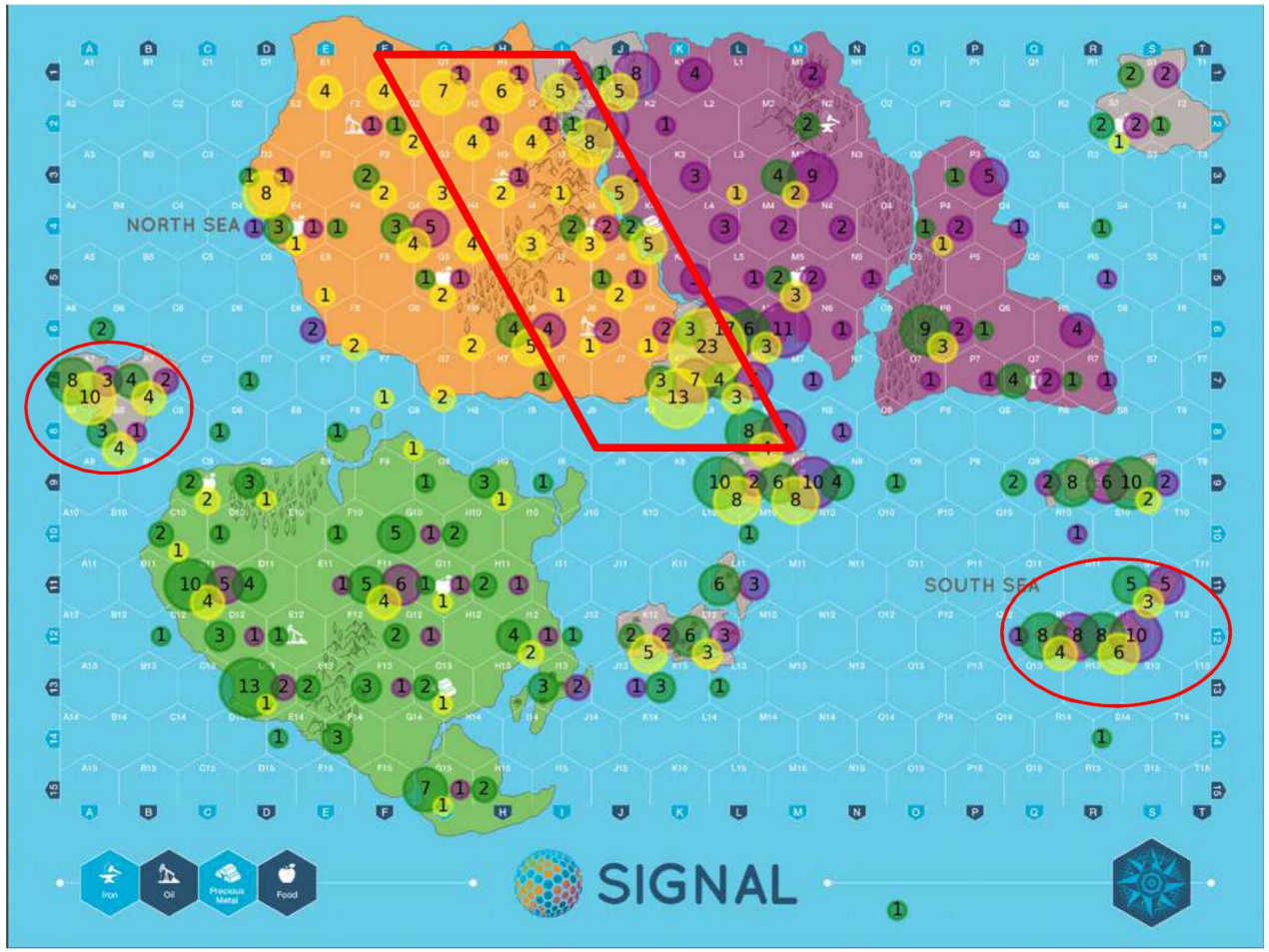
Because our wargames are experimental, we are interested in whether there are systematic differences in behavior across different types of scenarios…



Experimental Wargames across Geographies

Wargames can be designed to consider how geography might affect escalatory outcomes (in the abstract)…

- Contiguous land borders
- Naval warfare
- Space as a geography
- Basing
- Alliance dynamics



Experimental Wargames across Geographies

Wargames can be designed to consider how geography might affect escalatory outcomes (in the real-world)…

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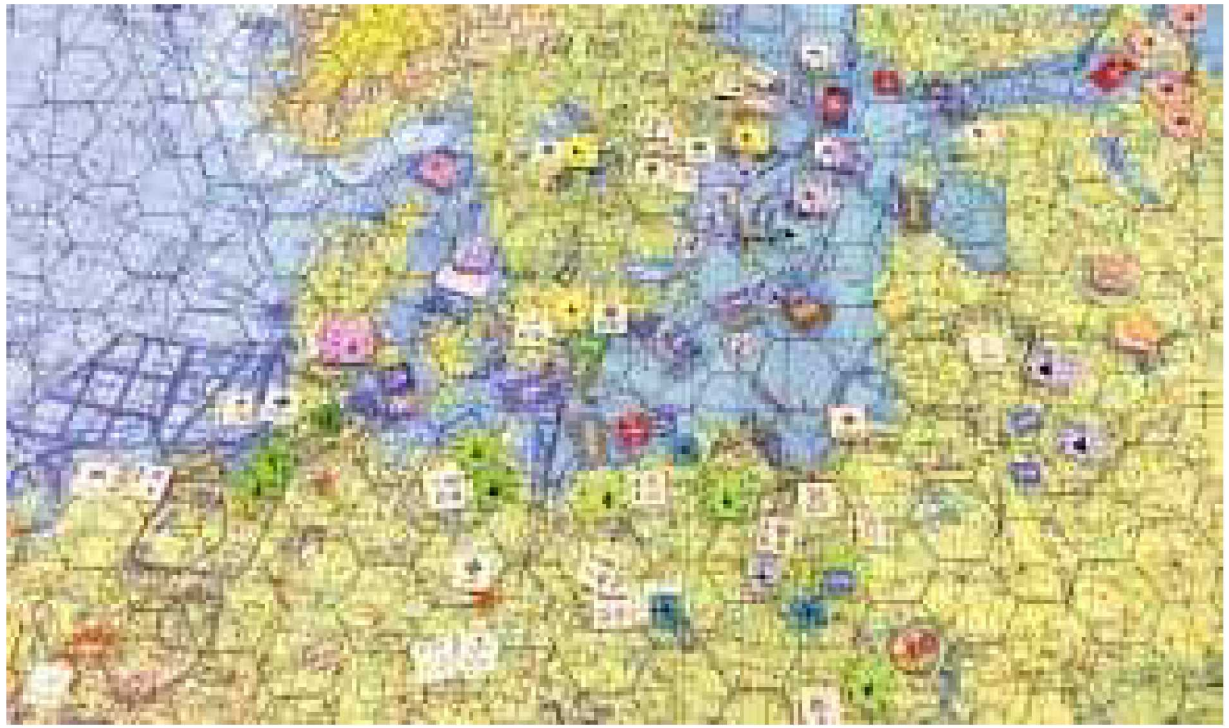
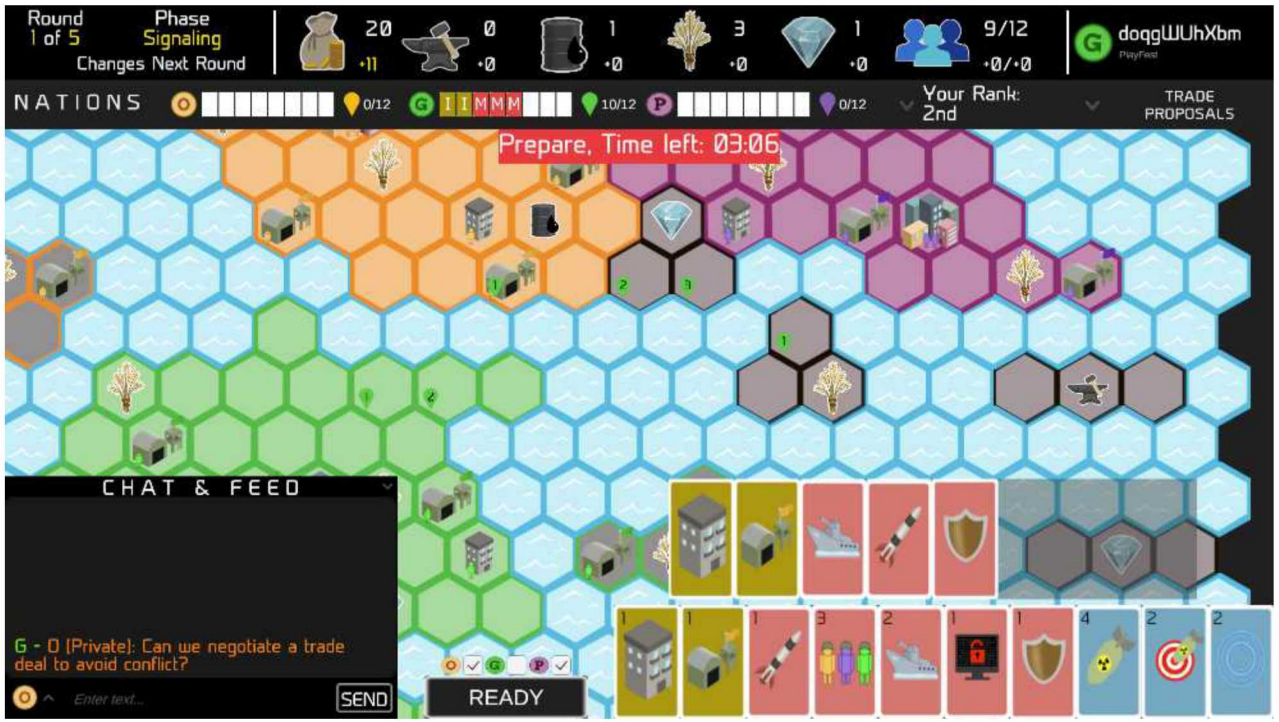


Experimental Wargames across Domains

Wargames can be designed to address conflict within and between domains…

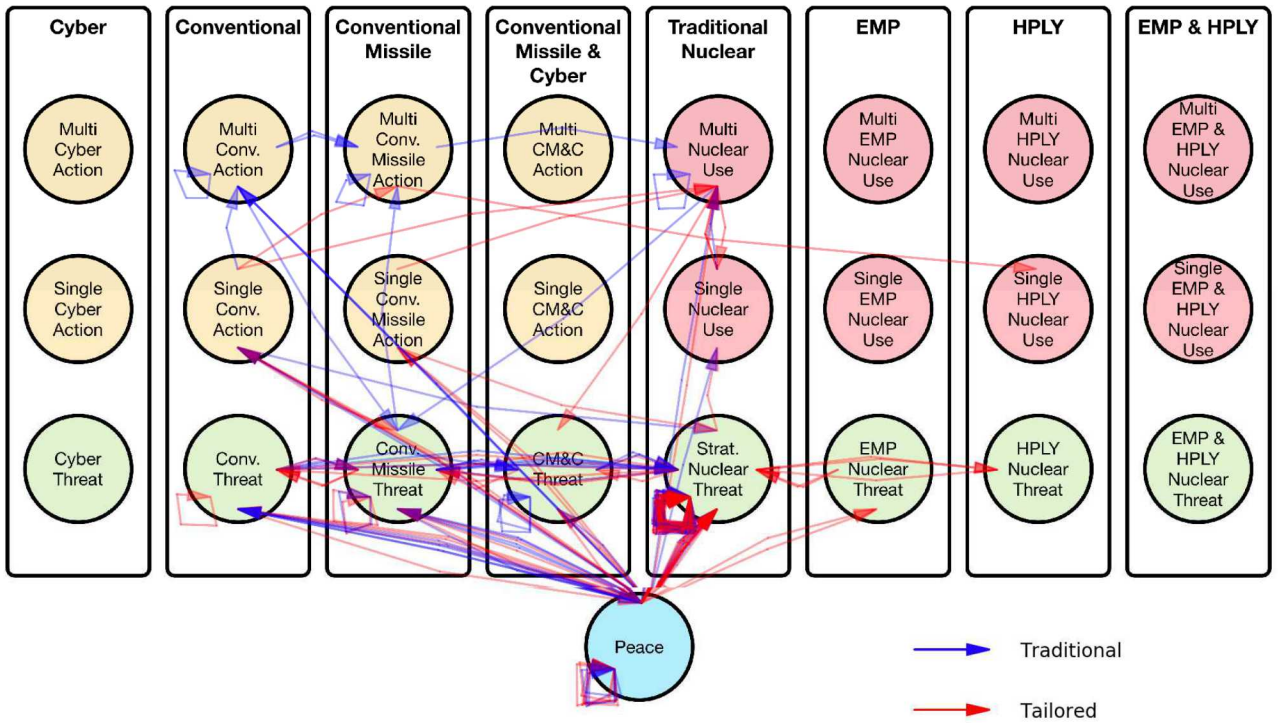
- Cyber
- Misinformation/disinformation campaigns
- Cross-domain
- A2AD
- Nuclear conflict and escalation
- Proliferation



Data Analysis

Wargames designed as experiments offer a rich source of data for analysis—particularly for questions where empirical data is absent or unavailable

- Analysis on processes
- Analysis on outcomes
- Chat
- Pre-surveys/post-surveys



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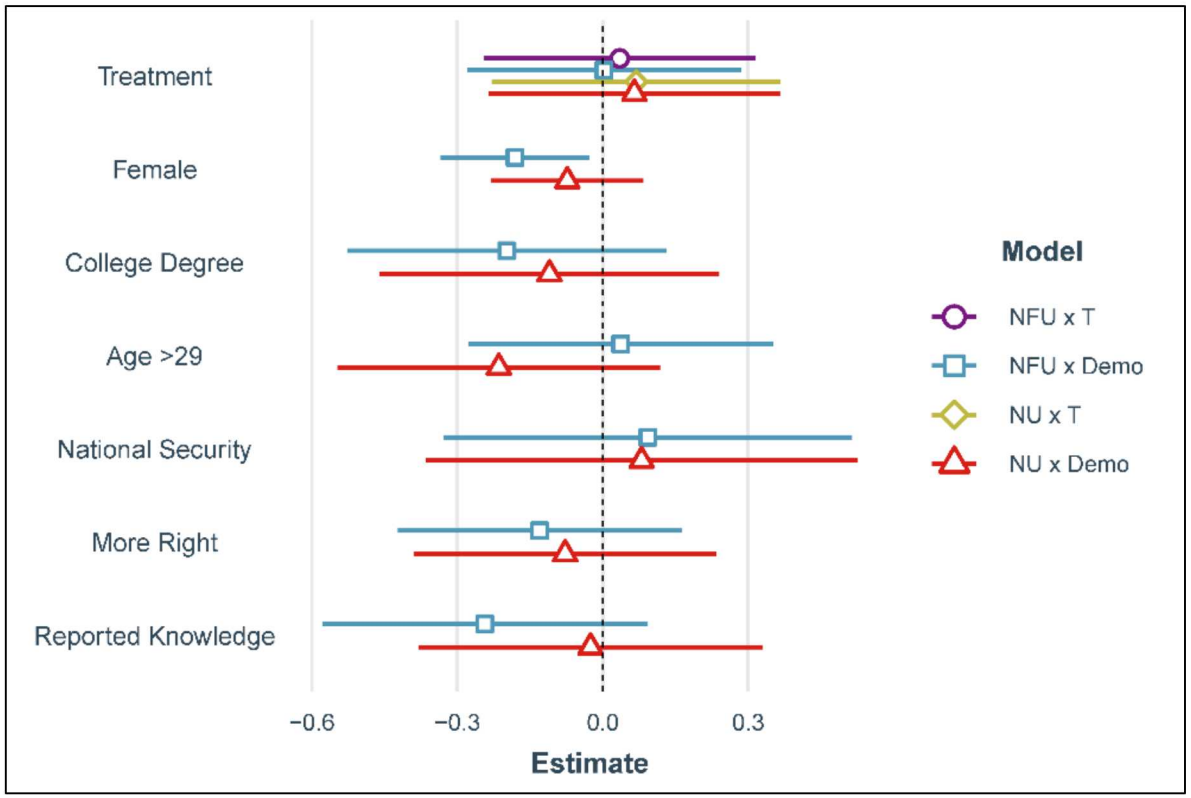


Method Validation Strategies

Because this methods offers a new DGP, we validate our approach:

Empirical Analysis

- Perform quantitative analysis using existing datasets used to investigate conflict escalation

Survey Experiment

- Create a separate, additional experimental environment to examine the behaviors found inside of the wargaming environment

Formal Modeling

- Use agent-based modeling tools to inform a parsimonious account of player behavior from first principles

Experimental Wargames in a NATO Context

This method, like other tools in the toolkit might be usefully put to work addressing proximate challenges facing NATO in service of:

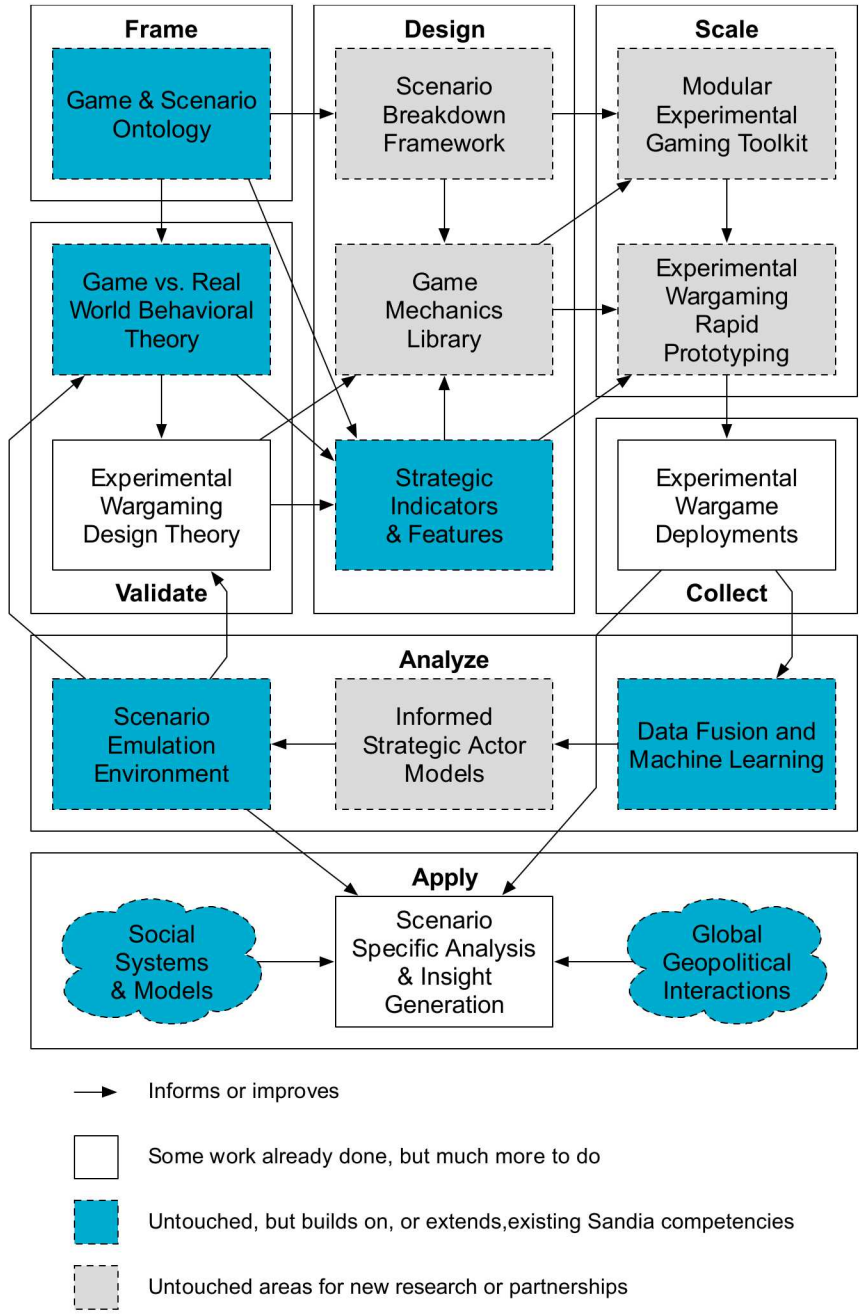
- Assurance
- Deterrence
- Resilience
- Risk reduction
- Coordination
- Cooperation
- Crisis decision-making

Gaming Research for Alliance Network Dynamics (GRAND)

- Platform to practice key elements of Alliance decision making in crisis scenarios
  - Leverages SIGNAL platform, technology stack, and analysis tools
- Abstract design that distills key aspects of competition and cooperation
- Key element of Alliance consensus making protocols built into mechanics
  - Allows new staff to familiarize themselves with elements of Alliance consensus making protocols
- Data collection on crisis escalation
  - Supports development of models of crisis on & off ramps (precursors/deescalatory factors)
- Configurable to multiple scenarios and varying number of players
- Online platform to allow players from across the world to participate from their locations
  - Better engages with important and busy personnel that have limited availability for standard wargames
- Funded by NATO-ACT (Kickoff in Sep. 2020)
  - NATO POC: Simon Purton and Wayne Buck

Experimental Wargaming: A Broader Vision

- How do you validate wargames and models that inform decision making?
- How do you generalize from multiple “deep” scenarios to broad principles?
- How do we transform wargame design from an artisanal process to one that is more automated/streamlined?



Kiran Lakkaraju
klakkar@sandia.gov

Andrew Reddie
areddie@sandia.gov