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Computation and Artificial Intelligence for Integrated Campaigning

Intelligence Community

LTC Thomas Pike, PhD

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AGENDA

- Background
- Al is a Discipline
- The Strength is the Ecosystem
- The Trade-Off Continuum
- Three Bins
- Integrating into the JIP and JPP
- Lead the Way



Background

Completed PhD in Computational Social Science (Complex Systems based program) at George Mason. Dissertation supported the SMA study *The Future of Global Competition and Conflict.*

Main Points:

- 1. The theoretic foundation (e.g. complex adaptive systems, complex systems, systems theory, complexity) of Joint Doctrine is strong.
- 2. The application of complex systems through JIPOE can be improved by changing from a categorical description to a discussion of the interdependencies with the operating environment.
- 3. Uniqueness is a key feature of complex systems, this means centrally derived solutions can support but NEVER replace local leaders.
- 4. Computation is a critical tool necessary to analyze complex systems and it use must be expanded across the force.



Al is a Discipline

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- Al is a discipline consisting of a suite of different computational approaches
- Machine Learning and Deep Learning consist of algorithms which update their parameters based feedback
- There is no universal algorithm
- Each approach and sub approach has strengths and weaknesses



The Strength is the Ecosystem



- The Open Source ecosystem allows advanced models with relative ease
- The code stores knowledge which others can employ over a diversity of situations





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A Complete Machine Learning Script					
# Sample Decision Tree Classifier					
from sklearn import datasets					
from sklearn import metrics					
<pre>from sklearn.tree import DecisionTreeClassifier</pre>					
# load the iris datasets					
<pre>dataset = datasets.load_iris()</pre>					
# fit a CART model to the data					
<pre>model = DecisionTreeClassifier()</pre>					
<pre>model.fit(dataset.data, dataset.target)</pre>					
print (model)					
# make predictions					
expected = dataset.target					
predicted = model.predict(dataset.data)					
# summarize the fit of the model					
print(metrics.classification report(expected,					
predicted))					
<pre>print(metrics.confusion_matrix(expected, predicted))</pre>					
(Brownlee, 2014)					

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The Trade Off Continuum



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The Trade Off Continuum





Three Bins

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Agent Based Models

- Simulate the behavior of a population at the individual (agent) level
- Virtual laboratory for policy/COA development
- Already being used for decision making and policy development



JIP Integration



*Agent Based Models



JPP Integration

Joint Plann	ing Proce	ess		
	Step 1	Planning Initiation		
	Step 2	Mission Analysis	Validated	Simulation JIPOE 2.0
	Step 3	Course of Action (COA) Development	Simulation Experimentation	
	Step 4	COA Analysis and Wargaming		
	Step 5	COA Comparison	Results Comparison	
	Step 6	COA Approval		
	Step 7	Plan or Order Development		



Lead the Way



What ABMs have:

- Management frameworks
- Agent order
- Data collection
- Visualization



What ABMS Need:

- 1. Libraries of Behaviors/Processes
 - Hard Coded
 - Machine and Reinforcement Learning
- 2. Synthetic Populations
 - From Data
 - Generic

OBJECTIVE: Reduce the build time to hours and days.

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Recommendations

Bottom Line: The joint force can improve the JIPOE process by (a) managing the analysis of relevant actor interdependencies to better understand links between behavioral trends and outcomes and (b) can do so more efficiently and rapidly through the expanded use Artificial intelligence and its collection of computational tools.

Update JIPOE (last week)

- **Test:** Identify organizations to implement updated approach (voluntary?)
- **Coordinate**: Synchronize with mutually supporting efforts (e.g. JP HAMO)
- Assess: Refine and Improve;
- Update: JIPOE guide

Increase use of computation:

- Literacy: Everyone can code (example of the national lunch program, business)
- Lead:
 - Build the Infrastructure
 - Improve the internal processes (research to operationalization)



QUESTIONS

LTC Tom Pike, Ph.D. Faculty Cyber Intelligence and Data Analytics Department Oettinger School of Science and Technology National Intelligence University

Office: ICC-B 200E-300U Email: thomas.pike@dodiis.mil Phone: 301-243-2223