Opportunity Title: Electro-Magnetic Spectrum Modelling and Simulation (EMS M&S)
Opportunity Reference Code: ICPD-2022-04

Organization Office of the Director of National Intelligence (ODNI)

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How to Apply **Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at: https://orise.orau.gov/icpostdoc/index.html.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/28/2022 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Modeling and simulation of a contested electromagnetic spectrum is incapable of satisfying current and future requirements. High end weapons rely on sophisticated electro-magnetic capabilities for attack/counter-attack, defense/counter-defense that creates an enormously cluttered and complex electro-magnetic environment. Under these conditions, performance reliability and capability characteristics loom as significant unknowns. Reasonably reliable, accurate, timely, and variable modeling and simulation capabilities are necessary to provide better insights and understanding of this environment.

Example Approaches:

Current computational modeling and simulation efforts against a complex environment must reach a reasonable accommodation with the environment's nonlinearity, scale, and complexity. In addition, efforts must be able to do so in a timely manner. Finally, results must be cognitively informative to allow decision-making trade-offs in-terms of resource variability and mission risk.

Traditional modelling and simulation has relied on mathematical formulation to define and establish functional relationships between input values and outcomes. However, non-linearity, scale, and complexity usually obviate this method as a discrete research approach. In its place, computational optimization has inspired nature-based metaheuristic approaches (simulated annealing, cuckoo search), and more even more recently, swarm intelligence approaches (e.g., ant colony and particle swarm optimization), which have shown promise against highly nonlinear problems. Despite the promise of these surrogate approaches in addressing non-linearity, challenges remain with respect to scale, timeliness, and understanding. The challenge in developing modelling and simulation for complex electro-

magnetic environments should use a physics based surrogate that solves scale, variability, and timeliness issues and provides for practical understanding.

Worthwhile research goals include:

- Identifying a good/excellent physics based surrogate construct to model a complex and contested electro-magnetic environment.
- Identifying a methodology to accurately replicate small-scale to large-scale solutions.
- Identifying “best-fit” approximations for a spectrum of decision-making.

Relevance to the Intelligence Community:

Modeling and simulation is an analytic method that can provide system characteristic and performance data and enhance understanding of a weapon system’s operational employment. More importantly, developing the ability to model and simulate blue-red interaction and engagement would provide significant insights that would benefit a broad spectrum of decision-making; from force size, shaping and acquisition, to operational planning, and engagement. Enhanced modeling and simulation in this spectrum will provide the Intelligence Community the means to provide answers to unknowns, clarify a complex environment, and add value to decision making processes.

Key Words: Modeling; Simulation; Modeling And Simulation; Computational Optimization; Surrogate-Based Optimization; Algorithm; Optimization Algorithm; Nonlinear Optimization; Stochastic Optimization

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 👁)
  - **Communications and Graphics Design** (2 👁)
  - **Computer, Information, and Data Sciences** (16 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)

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- **Environmental and Marine Sciences** (14 👁)
- **Life Health and Medical Sciences** (45 👁)
- **Mathematics and Statistics** (10 👁)
- **Other Non-Science & Engineering** (2 👁)
- **Physics** (16 👁)
- **Science & Engineering-related** (1 👁)
- **Social and Behavioral Sciences** (27 👁)