Opportunity Title: RF Machine Learning Performance Bounds Fellowship
Opportunity Reference Code: ICPD-2024-51

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 3 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 2/28/2024 6:00:00 PM Eastern Time Zone

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

Machine learning, broadly speaking but especially in the current focus of deep learning, depends on empirical testing against one or more open, published datasets to provide feedback on performance. This is problematic if datasets are not aligned with problems of interest or in that we have limited insight to fundamental performance bounds. As an analogue, Shannon's theorem provided a bound for the rate of information to be transmitted through a given channel, which resulted in a means to evaluate performance between communication systems as well as the intrinsic limits. The ability to develop and articulate machine learning performance bounds when applied to RF and communication theory would immediately cut through the challenge and expense of datasets. Crucially, it would also provide insight on whether current machine learning approaches are already performing at or near optimum performance. Leveraging machine learning to benefit the IC workforce is crucial, if we are to gain strategic and enduring advantage with our allies/partners and against adversaries.

Example Approaches:

An initial example would be determining the performance bound for classifying a bounded set of modulations with various signal to noise levels. An approach would be determining the mutual information between the input signal and the identified classes that can be used to identify a performance bound.

Relevance to the Intelligence Community:

Develop/enhance understanding of polarimetry to improve automated processing and object detection and identification.
Develop/enhance standards and methods to address challenges of processing, sharing, and analyzing spectral and spatiotemporal data within

emerging high-performance computing and cloud architectures.

Key Words: RF, machine learning, signal classification, signal detection, modulation classification, modulation detection

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 appointment start date
- 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** (5 👁)
  - **Computer, Information, and Data Sciences** (17 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)
  - **Environmental and Marine Sciences** (14 👁)
  - **Life Health and Medical Sciences** (45 👁)
  - **Mathematics and Statistics** (11 👁)
  - **Other Non-Science & Engineering** (2 👁)
  - **Physics** (16 👁)
  - **Science & Engineering-related** (1 👁)
  - **Social and Behavioral Sciences** (30 👁)