Opportunity Title: Advanced Processing for Real-Time RF Mapping
Opportunity Reference Code: ICPD-2025-16

Organization Office of the Director of National Intelligence (ODNI)

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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 2/28/2025 6:00:00 PM Eastern Time Zone

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

Radio frequency (RF) mapping involves monitoring and analyzing electromagnetic signals to identify, locate, and track a range of communication devices. It is an important tool used across various fields to understand the electromagnetic landscape in a given area. However, this process comes with challenges such as the complexity of signal propagation in different environments, interference from multiple sources, and the dynamic nature of signals over time. Optimizing RF mapping to enhance its effectiveness, precision, and efficiency is becoming increasingly important as communication technologies continue to evolve.

The ability to analyze RF data in real time is crucial for a range of applications; however, this is associated with technical and operational challenges that must be addressed to achieve accurate and efficient outcomes. Urban environments have a high density and diversity of wireless signals, generating a large amount of data during RF mapping. This creates significant noise and interference that complicates efforts to isolate relevant signals and interpret useful information in real time. Traditional processing methods struggle to handle the volume and complexity of this data, making it difficult to provide the real-time analysis that is necessary for quick decision-making. Reducing the time delay between data collection and acquiring actionable insights would have significant implications in a number of fields. Therefore, innovative approaches are required to streamline RF data processing, enhance analytical capabilities, and generate rapid outputs.

Example Approaches:

To address these challenges, more efficient methods capable of filtering and analyzing large volumes of RF data in real time are required. A key focus will likely be the application of machine learning and artificial

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intelligence tools, which can be trained to recognize patterns, filter out irrelevant signals, detect anomalies, and prioritize actionable data in congested spectrum environments. Proposed methods should be able to dynamically adapt to changing signal environments and accurately recognize common sources of interference. Edge computing approaches could also be considered to help process data closer to source to enable faster decision making in critical situations. Potential solutions should also be designed with scalability in mind to accommodate the growing network of modern communication devices. Additionally, consideration should be given to the integration of RF mapping data with other data sources in order to enable improved accuracy, provide better context, and achieve a more comprehensive understanding of the signal environment.

Key Words: RF mapping, signal processing, machine learning, artificial intelligence, real-time analysis

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

Point of Contact

Keri Tarwater

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Communications and Graphics Design** (3)
  - **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)