Opportunity Title: Detection of Genetic Engineering and/or Synthetic Biology Fellowship
Opportunity Reference Code: ICPD-2024-40

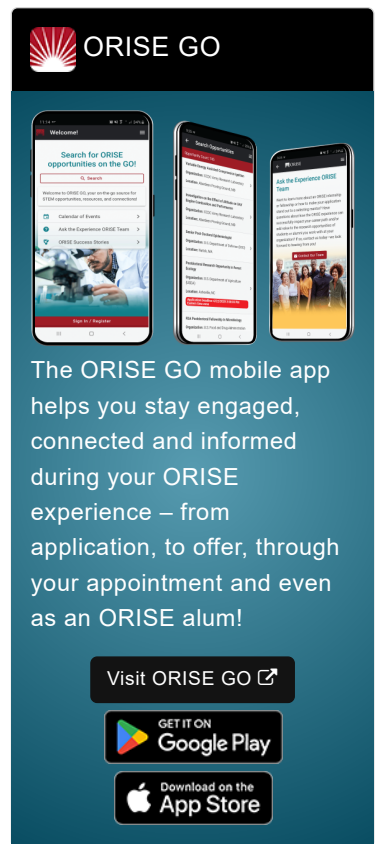|	
Organization	Office of the Director of National Intelligence (ODNI)
Reference Code	ICPD-2024-40
How to Apply	**Create and release your Profile on Zintellect** – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may 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	2/28/2024 6:00:00 PM Eastern Time Zone
Description	**Research Topic Description, including Problem Statement:**

The timely detection and identification of a biological hazard is critical to minimizing the impact of an event, whether that be a natural event (e.g., emergence of a new viral strain such as SARS-Cov-2) or a nefarious release (e.g., intentional dissemination of material such as the Amerithrax attacks). Microbial forensics represents a new and emerging area of science which goes further than simply detecting an organism is present in a sample, by determining the material's provenance and whether there are any signatures of nefarious release (e.g., evidence of laboratory growth, changes in the genome). The identification of genetic modifications (GM) of an existing pathogen and/or the creation of new organisms with the potential to be pathogenic to human health represents key attributable intent (i.e., nefarious). Approaches that enable the detection of these signatures will therefore be crucial to improving government preparedness against the misuse of GM and/or SynBio microorganisms.

The detection of the use of GM and/or SynBio represents a significant technical challenge. Traditional bioinformatics tools that interrogate genome sequencing data are limited with respect to the complexity of data that can be analyzed (e.g., cannot interpret metagenomic data) and often require significant lengthy onward human intervention (e.g., lack automation, AI). New bioinformatics approaches are required – potentially involving artificial intelligence and data science fusions – in order to interpret complex genomics data and also identify the presence of genetic engineering.

This proposal seeks the generation of completely new approaches to this problem, benchmarking these newly developed techniques against traditional bioinformatics pipelines used in genomic analysis and demonstrating performance improvements with respect to the detection of the use of genetic engineering and SynBio.

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Example Approaches:

A possible approach may include:

- Assessing the current "market" with respect to bioinformatics tools that could be used for the intended purpose.
- The development of curated reference database(s) of signatures of genetic engineering and/or the use of SynBio.
- Bioinformatics tools and pipelines that can map genomics data (both DNA and RNA) robustly to publicly accessible reference databases and are able to screen for the presence of indicators of GM and/or SynBio.
- Provide graphic user interface (GUI) that provides a preliminary interpretation of the result and/or highlights areas of interest within the genomics data for furthermore targeted investigation.
- Use openly accessible reference genomes as training data sets to apply AI-machine learning techniques in order to improve the efficacy of the tools for identifying markers of genetic engineering and/or SynBio.
- Undertake performance tests using pre-existing genomics data in the public domain to demonstrate the robustness of the technique to separate between natural organisms and genetically engineered or synthetic organisms.

Key Words: Genetic modifications, Synthetic Biology, Biosecurity; Detection; Attribution.

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** (17 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)
  - **Environmental and Marine Sciences** (14 👁)
  - **Life Health and Medical Sciences** (45 👁)

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- **Mathematics and Statistics** (11 👁)
- **Other Non-Science & Engineering** (2 👁)
- **Physics** (16 👁)
- **Science & Engineering-related** (1 👁)
- **Social and Behavioral Sciences** (30 👁)