Opportunity Title: Identifying Inter-Brain Communication Paths Fellowship
Opportunity Reference Code: ICPD-2024-36

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:**

Direct brain-to-brain (BTB) communication has been a subject of intense interest for many years. It has been demonstrated that networked rat brains were “smarter” than a single animal.1 Such a network could enable a biological computer that could enhance or alter human performance. For example, it could enable people to work across language barriers or provide those whose ability to communicate is impaired with a new means of doing so or provide support for impaired functions. Current efforts for identifying BTB communication focus on communication with or to a computer. Here, the computer is either the initial endpoint (i.e. thoughts sent to computer turn into text) or a “middleman” that then produces a secondary output (i.e. sending a signal which is then transmitted into another brain through technology such as transcranial magnetic stimulation (TMS)). These efforts better represent one-way communication (brain-to-computer, computer-to-brain) rather than BTB. Sending an electrical signal from the brain is different to the brain receiving and interpreting it. It is relatively straightforward to emit a conscious signal i.e. from the motor cortex to move a hand. However, the brain’s interpretation of that electrical signal is complex as it engages visual, audio and other regions required to interpret sounds, language and context. Brain structure and tissue impedance can be subtly, yet highly individualized. If communication is at the preconscious / conscious electrical signal level, it potentially removes the need for mouth generated speech or audio processing from the ears, therefore the brain regions controlling speech generation and audio processing become less relevant. If humans do not use the known speech and language processing regions, which regions would be most important or useful in potential BTB communication?

Fundamental new knowledge of BTB communication is required in order to inform and mitigate risks posed by this developing technology.

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Example Approaches:

Explore the creation of a brain fingerprint that identifies the necessary regions for processing and interpreting pre-conscious/conscious signals in the absence of standard/expected speech/audio.

A literature review of BTB developments with respect to inter-brain communication paths.
Explore methods for whole-brain mapping to determine optimal arrangements.
Map preconscious signal patterns and use these patterns to identify optimal arrangements.
Identify barriers to BTB development and experiment with potential solutions.

Relevance to the Intelligence Community:

Brain interface science and engineering is a rapidly developing field, driven mostly by medial interest. Implications of the use of new discoveries in this field extend beyond medical benefits into future computing, human augmentation, privacy and security. Potential developments in discreet communication and sensing poses risks to the NIC that should be understood.

Reference:

1 Pais-Vieira, M., Chiuffa, G., Lebedev, M. et al. (2015) 'Building an organic computing device with multiple interconnected brains', Scientific Reports, https://doi.org/10.1038/srep11869

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** (3 👁)
  - **Computer, Information, and Data Sciences** (16 👁)

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- **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 👁)