Opportunity Title: New algorithms for fast cone-beam computed tomography (CBCT) reconstruction
Opportunity Reference Code: IC-18-02

Organization Office of the Director of National Intelligence (ODNI)

Reference Code IC-18-02

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://orau.org/icpostdoc/.

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

Application Deadline 3/12/2018 11:59:00 PM Eastern Time Zone

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

- Cone-beam computed tomography (CBCT) is broadly used for medical applications as well as hardware assurance, verification, and validation.The conventional algorithm for image reconstruction has been the 1984 algorithm by Feldkamp, Davis, and Kress (FDK) for circular cone-beam tomography.The FDK algorithm is still used in state-of-the-art cone-beam scanning devices and is an analytical reconstruction method resulting in a filtered back-projection scheme.FDK is an extension of exact 2D reconstruction algorithms for fan-beam projections to a 3D case by properly adapting the weighting factors.
- The FDK algorithm has two areas for improvement – speed and quality of the reconstruction.A typical CBCT scan for hardware assurance and validation takes hours to reconstruct with FDK.Additionally, hardware CBCT scans are more problematic than medical scans due to the extensive scattering and shadowing due to the high metal content.With hardware CBCT and the FDK algorithm, the resultant reconstructed 3D images have significant noise and shadowing which interfere with downstream assurance and validation algorithms.
- With the advent of readily available GPU-based computing platforms, the time is right to re-visit the CBCT reconstruction algorithm to improve the speed and quality of the reconstruction.
- Imaging machines and techniques can introduce variances in the CBCT raw data.To eliminate these variances, the topic authors will provide the CBCT raw data.

Opportunity Title: New algorithms for fast cone-beam computed tomography (CBCT) reconstruction
Opportunity Reference Code: IC-18-02

Example Approaches:

- There are a number of alternative (non-FDK) approaches to CBCT reconstructions that could be reconsidered due to the increased computer processing power that can be applied.This research may investigate old and new algorithms that have been researched and published.
- The various algorithms could be evaluated for their theoretical applicability to increase the speed and quality of the CBCT reconstruction.
- The most promising algorithms could be evaluated on CBCT data provided and evaluated for the somewhat unique hardware assurance and validation examples in the data set

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** (6)
  - **Computer, Information, and Data Sciences** (16)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (10)
  - **Other Non-Science & Engineering** (5)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (28)