Opportunity Title: Deep Learning and Inference Using Models with Low Precision Synapses and Binary Unit Activations
Opportunity Reference Code: ICPD-2021-14

Organization	Office of the Director of National Intelligence (ODNI)
Reference Code	ICPD-2021-14

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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 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 2/26/2021 6:00:00 PM Eastern Time Zone

Description

Research Topic Description, including Problem Statement:

Deep learning has revolutionized the field of machine learning. However, current approaches to deep neural network training require backpropagation of errors with high precision. This poses a challenge for training deep neural networks on future generation, low-power edge computing platforms under the constraint of low-precision (possibly binary) weights and binary unit activations. Recent research on binary neural networks (BNNs) and spiking neural networks (SNNs) offers hope that a solution to this problem can be found. However, this remains an open problem. Approaches may involve simulators, field-programmable gate arrays (FPGAs), and/or neuromorphic hardware.

Example Approaches:

- "EventProp: Backpropagation for Exact Gradients in Spiking Neural Networks" arXiv:2009.08378
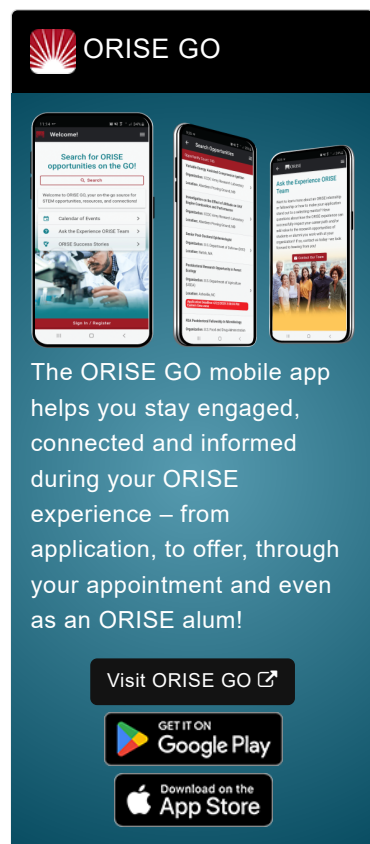- "Training Binary Neural Networks with Real-to-Binary Convolutions" arXiv:2003.11535

Relevance to the Intelligence Community:

The Intelligence Community (IC) will increasingly rely on edge computing platforms to detect patterns of interest in sensor data. Developing algorithms for training and inference on future generation, low-power edge computing platforms will ensure that the IC is able to take full advantage of these platforms.

Key Words: Deep Learning, Machine Learning, Artificial Intelligence, Neuromorphic, Low Precision, Event Based Computing, Neural Networks, SNN, BNN

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 👁)
  - **Mathematics and Statistics** (10 👁)
  - **Other Non-Science & Engineering** (2 👁)
  - **Physics** (16 👁)
  - **Science & Engineering-related** (1 👁)
  - **Social and Behavioral Sciences** (27 👁)