

**Opportunity Title:** Agent based dynamic network optimization and control

**Opportunity Reference Code:** IC-18-03



**Organization** Office of the Director of National Intelligence (ODNI)

**Reference Code** IC-18-03

**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](mailto: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:**

- This research topic addresses the fundamental challenges arising from integrating data-driven paradigms in settings where agents seek to make strategic decisions in a decentralized manner. In particular, agents strive to establish reliable network connections in uncertain and often contested environments. The work expands efforts in modeling the structural behaviors of functioning networks relying on transmission of inference decision-making capabilities. Each agent dynamically processes neighbor and environment data to make local inferences about strategic connections and relationships. All agents cooperatively or non-cooperatively attempt to optimize their objective function. An emphasis is placed on data-driven paradigms and behavior-embodied assumptions of the actor-centered network models.
- Specific research project aims are:
  - Investigate systemic analysis based on real-world data collected from diverse data streams. Results should elucidate statistical properties of various metrics characterizing information cascades between groups and individuals. The research should allow one to gain insight into typical cascade patterns to be expected from different types of communication.
  - Develop effective strategies of identifying “key players” with vital roles in cascade spread. These “key players” can be viewed as “precursors” of large-scale dissemination of information and influence. Strategies for preventing large-scale cascades of “negative” information by interdicting (i.e., by “blocking”) a relatively small number of nodes in a social network is expected.
  - Investigate the effects of false identity (or “sybil”) nodes on structure and scale of viral spread information spread through a social network. This includes information originally posted or reposted by false identity accounts.
  - Develop new frameworks for modeling systemic risks and related risk-benefit analysis for strategic decision processes.

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### Example Approaches:

- Investigate how and why viral information and influence dissemination cascades in complex networks due to viral marketing and reposting activities. The research could leverage publicly available massive real-world datasets collected from various well-known social media network platforms, including Facebook, Twitter, VKontakte, and others. Additional sources of data can test rapid agent decision making under information limited scenarios to understand gaps in agent logic or emergent traits of agent coping mechanisms. Research uncovering statistical properties of metrics characterizing information cascades, dependencies, and composition of individuals or groups participating in the eco-system might inform agent fault tolerances.
- Create forecasting algorithms to track how “key players” (individual nodes or groups of nodes) act as “precursors” of information cascades in social networks and may cause massive dissemination of certain information, propaganda, etc. Analyzing structural attributes (i.e., network positions or influence base) of key players could allow the development of strategies for interdicting massive diffusion of information in online social networks via identification and blocking key players. Moreover, effects of false identity (or “sybil”) nodes on information cascade patterns may be studied.

### 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 )