NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

NSF 17-074

Dear Colleague Letter: Simulated and Synthetic Data for Infrastructure Modeling (SSDIM)

March 30, 2017

Dear Colleagues:

With this Dear Colleague letter (DCL), the National Science Foundation (NSF), in collaboration with the Department of Homeland Security (DHS), announces its intention to fund EArly-Concept Grants for Exploratory Research (EAGER) proposals as well as supplements to existing relevant NSF awards from the Directorate for Engineering and the Directorate for Computer and Information Science and Engineering in support of research to develop and make available simulated and synthetic data on interdependent critical infrastructures (ICIs), and thus to improve understanding and performance of these systems.

In the context of this DCL, prospective principal investigators (PIs) are encouraged to refer to the definition of ICIs and infrastructure interdependencies in NSF's Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP) program solicitation (see NSF 16-618).

Here, "simulated data" refers to data that are derived (via downsampling, aggregation, or other techniques) from actual data on infrastructure design and/or operations. Simulated data are typically intended to represent ICIs in an actual community. On the other hand, "synthetic data" refers to data that are produced (via simulation or other approaches) from first principles, without access to real data. Synthetic data may or may not represent ICIs in an actual community, but are intended to be plausible representations of actual or possible ICI designs or processes.

This DCL invites proposals for research that would contribute significantly to the scientific basis of simulated and synthetic data on ICIs. Representative topics include but are not limited to the following:

- mathematical foundations, including algorithms and heuristics for creating simulated or synthetic data;
- development of specific data creation techniques, such as localization/homogenization and downsampling/aggregation;
- approaches to data verification and validation;
- innovations in data science and engineering (e.g., data integration, fusion, scaling);
- model-based and other approaches to simulation of plausible network topologies; and
- incorporation of existing or new approaches for simulating data on human cognition and/or behavior within ICIs.

Proposals should address mechanistic and human aspects within at least two distinct critical infrastructures, along with interdependencies among them; proposals that do not address interdependencies or that address only human or only mechanistic aspects of infrastructures will not be considered. PIs are encouraged to propose research that considers a broad range of ICIs.

Proposed work may produce data on physical, economic, or other characteristics of ICIs. Proposers should articulate how the data they produce can support improved understanding and prediction of the

interactions between ICIs and the populations they serve, as well as how these data can contribute to better understanding of demand for ICI-based services. EAGER proposals must include a Data Management Plan that discusses plans for generating and publishing at least one open-access data set from the results of the funded research, as well as any computer code or related tools used to generate and analyze these data. Proposals should also address how these data may be leveraged by existing modeling approaches as appropriate.

Proposals may be submitted either as EAGER proposals or as requests for supplements to existing awards. See the NSF Proposal & Award Policies & Procedures Guide (PAPPG) for guidelines and expectations for these types of proposals. In addition:

- For EAGER proposals pursuant to this DCL, the anticipated award size will be up to $300,000, (award size, however, will be consistent with the project scope and of a size comparable to grants in similar areas), and
- For supplements to existing awards pursuant to this DCL, the maximum award size will be limited to 20% of the original award or $300,000, whichever is smaller, subject to availability of funds.

For either type of proposal, interested PIs must contact one of the individuals listed below prior to submission to discuss the scope of the submission:

David Mendonca
Program Manager, Infrastructure Management and Extreme Events
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Erin Walsh
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EAGER proposals and requests for supplemental funding must be submitted by June 1, 2017, using NSF Program Element Code PD 17-1638. Earlier submissions are encouraged and decisions will be made on an ongoing basis.

Sincerely,

Barry W. Johnson
Assistant Director (Acting)
Directorate for Engineering

Jim Kurose
Assistant Director
Directorate for Computer and Information Sciences and Engineering