NSF 15-112

Dear Colleague Letter: Self-Monitoring and Self-Assessing Intelligent Systems Research for the CISE/IIS Robust Intelligence Core Program

August 28, 2015

Dear Colleague:

Through this Dear Colleague Letter (DCL), the Division of Information and Intelligent Systems (IIS) within the Directorate for Computer and Information Science and Engineering (CISE) announces its intention to support research on self-monitoring and self-assessing intelligent systems through its Robust Intelligence (RI) core program.

Recent years have brought about an explosion of interest in intelligent systems research and applications, including research on human language processing systems, computer vision systems, machine learning, robotics, software agents, cognitive systems, and systems that automatically monitor data and make predictions (including classification).

However, achieving truly robust behavior of intelligent systems requires that they self-assess, recognize their own limits, accurately predict their own breakdown, and act appropriately. Robust intelligent systems must encode and act in awareness of their own performance limits and uncertainties. This *self-assessment* criterion goes far beyond performance assessments typically reported during evaluation (e.g., rates of classification, word-error, and task completion), which provide very incomplete assessment of the real-world utility of intelligent systems. Only with attention to these additional challenges can we construct systems that are robust even when sensor inputs and user commands are incomplete, erroneous, or manipulated by an adversary; and when the system learns, adapts, self-modifies, or encounters novel situations after deployment.

The Robust Intelligence core program within the IIS division welcomes proposals (as part of the existing RI program solicitation, available at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf15574) that advance self-monitoring, self-assessment, self-repair, and user interaction to ensure that intelligent systems behave as intended. These advances include (but are not limited to) research that specifically addresses: 1) performance uncertainty measures, 2) self-diagnosis, 3) how to ensure system behavior after deployment, 4) system self-inspection and self-repair, and 5) behavioral modification when the system is not behaving as expected.

With recent growing interest in these areas within the Robust Intelligence research community, this DCL explicitly calls attention to the inclusion of these topics within the scope of the existing IIS RI program. Proposals submitted in response to this DCL will be reviewed in competition with all other proposals submitted to the RI program; this is neither a special competition nor a new program, and proposals will be funded as part of the core RI program budget. Proposals submitted in response to this DCL should be synergistic with RI approaches and must contain clear RI research components as described by the RI program solicitation; if they do not, they may be returned without review. Proposal

ideas that do not fit within the RI program solicitation but appear to address topics related to this DCL should be submitted to other relevant NSF programs.

Proposals relevant to this DCL should be submitted to the regular RI core program solicitation, available at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf15574, following all proposal preparation instructions specified therein. For further information, interested PIs may contact Todd Leen (Program Director, CISE/IIS, telephone (703) 292-7242, email tleen@nsf.gov) and Hector Munoz-Avila (Program Director, CISE/IIS, telephone (703) 292-7129, email hmunoz@nsf.gov).

Sincerely,

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Computer and Information Science and Engineering (CISE)