Dear Colleague Letter: Unsolicited Proposals at the Interface of Mathematical Sciences and Computer Sciences

Dear Colleague:

The Division of Mathematical Sciences (DMS), of the Directorate for Mathematical and Physical Sciences, and the Division of Computing and Communication Foundations (CCF), of the Directorate for Computer and Information Science and Engineering at the National Science Foundation, have a long history of supporting basic research at the interface of mathematical sciences and computer sciences. DMS and CCF recognize that it is vital for mathematicians and statisticians to collaborate with computer scientists – both in new research projects and in ongoing research projects – in order to advance the frontiers of discovery and innovation. This letter is to remind the mathematical sciences community and the computer science community that DMS and CCF welcome proposals from interdisciplinary research teams on projects of mutual interest in specific areas of mathematical sciences and computer sciences:

1. ***Point-Cloud Data Analysis***: The emphasis of this research topic is on the development of new mathematical, statistical, and computational methods that can extract shapes and patterns from point cloud data while assuring the integrity of the geometry and topology. Topics of interest include geometric modeling and processing using point primitives, topological properties of point cloud data, sampling, approximation and interpolation algorithms, compression of point-sampled geometry, and rendering algorithms for point primitives.
2. ***Multiscale Modeling and Computation***: This topic emphasizes discovery of new algorithms and novel techniques that connect different scales and provide insightful information about complex systems dominated by multi-scale nature. Topics to be included, but not limited to, are new algorithm design and analysis, peta-scale computing with applications, algorithm scalability and portability.
3. ***Algebra in Computer Science***: We seek innovative uses of linear, multilinear, and abstract algebraic structures and algebraic techniques in the design of algorithms as well as in the proof of bounds on approximability and the computational and communication complexity. Areas of interest include algorithms, cryptography, coding theory, complexity theory, and image and signal processing.
4. ***Learning Theory***: A number of theoretical problems in learning theory can benefit from interaction between statistical inference and methods on the one hand and foundational aspects of computer science on the other. Examples of specific topics are various forms of learning including inductive and transductive learning; (Bayesian) graphical networks; learning models inspired by methods of statistical physics; and possibly, game theory. Novel fundamental techniques inspired by all areas of current applications including high dimensional data reduction, imaging, econometrics, behavioral and social applications will also be considered.

Research proposals addressing cross-cutting topics in one or more of the above thematic areas can be submitted to either the DMS Computational Mathematics Program or CCF Algorithmic Foundations Program for joint consideration. Such proposals are managed by a team consisting of program directors in DMS and CCF. Investigators are encouraged to contact the appropriate program director to discuss the research idea/topics and research effort prior to submitting a proposal. Proposals addressing the interface between mathematical sciences and computer sciences areas should include the label "MCS:" at the beginning of the proposal title. Proposals

must be submitted in accordance with the deadline and proposal submission window specified for unsolicited proposals for DMS/Computational Mathematics and CCF/Algorithmic Foundation programs, respectively. PIs are encouraged to consult the following NSF web sites for more information:
http://nsf.gov/funding/pgm_summ.jsp?pims_id=5390&org=DMS&from=home
http://nsf.gov/funding/pgm_summ.jsp?pims_id=503220&org=CCF&from=home

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Sincerely,

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