SIAM Activity Group Applied and Computational Discrete Algorithms
Charter Renewal Application

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Applied and Computational Discrete Algorithms. The SIAM Activity Group (or SIAG) to which this renewal applies was originally formed under the aegis of SIAM in December by the SIAM Council and December 8, 2018 by the SIAM Board of Trustees with its initial operating period beginning January 1, 2019 and ending December 31, 2020.

This SIAG has 184 members, including 138 student members, as of December 31, 2019. (As of March 31, 2020, there were 291 members.)

According to its Rules of Procedure, the objective(s) of the SIAG are to foster activity and collaboration on the computational solution of combinatorial problems arising in many application areas. It seeks to promote the formulation of computational problems from application areas in terms of combinatorial models, the development of theory and algorithms to solve these problems, the implementation of the algorithms in software, and the deployment of the software in the application domains. The SIAG will bring together mathematicians, computer scientists, statisticians, domain scientists, and engineers from academia, the national and other research labs, and industry to promote research in applied and computational combinatorics. The SIAG will organize a biennial conference on Applied and Computational Discrete Algorithms, sponsor minisymposia at the SIAM Annual Meeting, and maintain an electronic discussion group.

Its proposed functions were

1. Organize minisymposia at the SIAM Annual Meeting and ICIAM in years where there is no SIAG conference.
2. At least once every seven years either organize a track of at least six minisymposia at the SIAM Annual Meeting or have an activity group meeting held jointly with the annual meeting. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG chair.
3. Organize a biennial SIAM Conference on Applied and Computational Discrete Algorithms. The SIAG will consider dovetailing specialized workshops and conferences with the SIAM Annual meeting or other SIAG conferences. The chair of the conference organizing committee shall be either the program director or the chairperson of the SIAG or their designee. The organizing committee must be approved by the VP for Programs at least 16 months before the conference.
4. With the approval of the SIAM Program Committee, the SIAG may organize special sessions at SIAM meetings. Other SIAG meetings may be organized only with the approval of the SIAM president and vice president for programs.

The SIAG has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

List all current officers of the activity group (including advisory board, if relevant).

Chair: Alex Pothen
Vice Chair: Blair Sullivan
Program Director: John Gilbert
Secretary: Cynthia Phillips

Advisory committee members were Bruce Hendrickson, Uwe Naumann and Madhav Marathe.

1. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last two years?

    The areas covered by the SIAG (combinatorial scientific computing, applied discrete mathematics, algorithm engineering, combinatorial optimization, theoretical computer science, etc.) are growing in importance as graph algorithms become a significant component of emerging applications such as scientific machine learning, data analytics, computational biology, cyber-security and a myriad other fields. Since we are trying to bring several subcommunities together, it is too soon to make statements about shifts in focus. One advance is the study of permutation-invariant representations of dynamic graphs in neural networks; in some contexts a network structure is natural, e.g., community networks, molecules, protein-interaction networks, etc.; in other contexts, sparse graphs are constructed from noisy, dense data. Another advance is the development of scalable parallel graph algorithms for extreme-scale computers via approximation algorithms and combinatorial BLAS operations.

2. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?

    The SIAG has grown steadily in its initial year and a half. We are looking to the First SIAM Conference on ACDA in July 2021 to attract new members through the submission of papers and talks, and participation. The SIAG has attracted several new members to the SIAM community.

    We have a significant fraction of students (68%), and this is a good sign for the future growth of the SIAG. 26% of the students are female, and 12% of the non-students are female. 65% of the members are from academia, 25% from the Labs, and 6% from industry. The ACDA conference and the SIAM Engage portal will be good venues for growing the membership of the SIAG. We will pay close attention to increasing women and under-represented groups' participation.

3. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years and give a brief (one sentence or phrase) indication of the success or problems with each.

    SIAM-ACDA sponsored the SIAM Workshop on Combinatorial Scientific Computing (CSC20), organized in Seattle, WA, Feb. 11-13, 2020. This meeting was co-located with SIAM PP20. Sherry Li (Lawrence Berkeley Lab) and Martin Buecker (University of Jena, Germany) were the Co-Chairs of the Program Committee. Fifteen referred papers were published in the Proceedings, and there were thirty talks in total. The number of papers and the number of participants showed a healthy increase over CSC18 held in Bergen, Norway in 2018. This is expected to be the last offering of the CSC workshop; in total, nine have been organized since 2004. See www.csc-research.org for information about programs and Proceedings of these Workshops; they are also available in SIAM conference archives.

    We sponsored the first SIAM Symposium on Algorithmic Principles of Computer Systems (APOCS20), a new symposium associated with SODA. Twelve papers were published in the Proceedings, and the talks presenting these papers filled one day in the SODA program.

    The First SIAM Conference on ACDA will be held in July 2021, co-located with the SIAM Annual Meeting. The Organizing Committee members represent several subcommunities such as CSC, theoretical computer science, applied discrete mathematics, combinatorial optimization, computational biology, etc. A hybrid conference with a proceedings of reviewed papers, talks selected from two-page abstracts, a few invited minisymposia, and a poster session is being planned.

4. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a track at an annual meeting or meet jointly with the SIAM Annual Meeting?

   *Because of the number of Activity Groups, the current guidelines are that an Activity Group should organize a track about every seven (7) Annual Meetings or meet jointly with the Annual Meeting within a seven (7) meeting period. *

   SIAM / CAIMS Annual Meeting 2020: Two minisymposia on ACDA were included. These will likely be presented virtually as of this time.

   ICIAM 2019: Two minisymposia on ACDA were organized.

5. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful?

   ACDA organized a listserv for the SIAG at siam-acda@siam.org for members to communicate with each other; Bora Ucar (ENS, Lyon, France) and Cindy Phillips (Sandia National Lab, Albuquerque, NM) served as the moderators. The listserv was used to send out email messages to keep the membership appraised of news. It replaced the CSC listserv maintained by Alex Pothen since 2004.

   SIAM ACDA organized a plenary lecture by Prof. David Shmoys (Cornell) as part of a reception to introduce SIAG ACDA to the attendees of the SODA cluster of conferences in January 2020. We also sponsored the first SIAM Symposium on Algorithmic Principles of Computer Systems (APOCS20) at SODA. Both these activities were well-attended.

   Several ACDA-related minisymposia were organized at the SIAM Conference on CSE in 2019, and Ariful Azad, Bora Uçar and Alex Pothen wrote a SIAM News article on these talks: bit.ly/36OX9kh.

   John Gilbert organized a minisymposium on behalf of ACDA at the SIAM Conference on Mathematics of Data Systems, which will be presented virtually in June 2020.

   Adrianne Ali of SIAM interviewed Alex Pothen for an article in SIAM Blogs about the creation of the SIAG: bit.ly/34CLGCS

   We sent a letter to the ACDA membership and to others in communities of interest summarizing the SIAG's activities in 2019, describing the planned activities for 2020, inviting non-members to join and also help recruit additional members.

   We created a Twitter account for the SIAG: @acda. Blair Sullivan tweets at this handle.

6. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

   The major activity is organizing the First SIAM Conference on ACDA. The organizing committee chairs are Bruce Hendrickson and Blair Sullivan; the program committee chairs are John Gilbert and Michael Bender. Other organizing committee members are: Rob Bisseling (CSC); Cliff Stein (theoretical computer science); David Williamson (operations research); Monika Henzinger (Algorithm Engineering); Christine Heitsch (computational biology); and Cynthia Phillips (liaison to SIAM Annual Meeting). The organization of this conference provides an opportunity to reach out to some of the communities named earlier and to establish precedence to help the community grow.

   We will participate in other conferences such as SIAM CSE, SIAM PP, SODA, etc., to present ACDA related work.

Members of the SIAG will make the new SIAM Engage portal a resource for the Activity Group to actively interact with each other, post content, etc. In response to a request from Tim Fest, we have identified fifteen members, in addition to the officers, who will test drive the portal and create content.

We have begun work to establish a few prizes for the SIAG. We have submitted the guidelines for the SIAM Early Career prize. We anticipate creating best poster and best paper, and best student prizes for the ACDA conference. We will also work to establish a SIAM-ACDA Career prize, which could be a longer-term undertaking involving fundraising.

7. How can SIAM help the activity group achieve its goals?

The SIAG will need a few iterations of the ACDA conference to establish itself. The SIAM Workshops on CSC had stabilized with Proceedings and selected talks after nine iterations. The level of participation at the first few conferences will help us to strategize in reaching out to the several subcommunities that make up the SIAG. It will also help us to decide if the community can support an annual conference (instead of being biennial), since conferences that include proceedings are usually annual. Patience with this process will be helpful.

Publicity in SIAM News, SIAM Blogs, the main SIAM web page, periodic mailings, etc. will help us to reach the broader SIAM community.

Discussion of a suitable SIAM journal for publishing work on ACDA needs to be undertaken once the ACDA conference is organized. Currently journal papers on ACDA are submitted to SISC, SIMAX, SIMODS, SICOMP and SIDM. It would be helpful to avoid some of this fragmentation.

8. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

We see this activity group as creating a vibrant applied and computational discrete algorithms community within SIAM to complement the existing Discrete Mathematics SIAG which has strengths in pure discrete mathematics. This area is becoming increasingly important with the wide-spread use of graphs in CSE, Machine Learning, Data Analytics, High Performance Computing, Network Science,

Computational Biology, Cyber-Security and other emerging applications. SIAM is the natural professional home for applied discrete mathematics, and we feel this SIAG can play an important role building community and helping to cross-fertilize between fields. It will take a few years for ACDA to become a flourishing SIAG with a conference, proceedings, an active Engage portal, and a venue for journal publication.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2021.

Signed,

Alex Pothen

SIAG/ACDA Chair
May 29, 2020