SIAM Activity Group Discrete Mathematics
2024 Charter Renewal Application

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Discrete Mathematics. The SIAG/DM was originally formed under the aegis of SIAM on July 19, 1984 by the SIAM Council and July 20, 1984 by the SIAM Board of Trustees. Its initial operating period began January 1, 1985 and ended December 31, 1987. Its charter has been renewed by the council and board fifteen times thereafter.

 This SIAG has 357 members, including 140 student members, as of December 31, 2023.

 According to its Rules of Procedure, it is the purpose of the SIAM Activity Group on Discrete Mathematics to foster research in discrete mathematics and the development of its applications, and to bring together and stimulate interaction between the various and diverse communities of mathematical scientists such as those who specialize in combinatorics, computer science, communications, and operations research. Within the framework of SIAM, the SIAG will conduct activities that implement its purposes.

The SIAG on Discrete Mathematics will organize activities in discrete mathematics. The SIAG is expected to:

1. Organize minisymposia at the SIAM Annual Meeting on years when there is no SIAG conference.
2. Organize a track of at least six minisymposia at the SIAM Annual Meeting at least once every seven. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG chairs.
3. Organize a biennial SIAM Conference on Discrete Mathematics. 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 18 months before the conference.
4. With the approval of the SIAM Program Committee, the SIAG may organize special sessions at SIAM meetings, and conduct special one- or two-day meetings immediately before or after a regular SIAM meeting. Other SIAG meetings may be organized only with the approval of the SIAM president and vice president for programs. SIAG meetings, workshops, and conferences may be organized only with the approval of the SIAM president and the SIAM 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: Dana Randall
Vice Chair: Maya Stein
Program Director: Daniel Panario
Secretary: Sarah Cannon

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?

Discrete mathematics continues to mature and integrate increasingly sophisticated concepts. The last two years saw many major breakthroughs. In a 2023 Quanta Magazine video, "The Year in Math," on the biggest discoveries in mathematics in 2023, all three highlighted results fell within the umbrella of Discrete Mathematics. First, they highlight a result due to Campos, Griffiths, Morris and Sahasrabudhe giving a stunning improvement to the best bounds on the Ramsey numbers, one of the central problems in enumerative combinatorics. They next highlight Kelley and Meka, who gave a substantial improvement to the area of arithmetic sequences by improving the bounds on the size of sets without three-term patterns. Last, they present the newly discovered "Einstein tile" which proves that there is a single monotile that can tile the plane aperiodically. All of these results used techniques from various areas of mathematics to produce surprising leaps forward in combinatorics and graph theory.

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?

Overall, the activity group is doing well. Membership has shrunk slightly over the last two years, but remains healthy. Membership decreases from 2022 to 2023 were smaller than those from 2021 to 2022, which is an encouraging trend. The decrease is likely partially due to the introduction of the ACDA SIAG, which has significant overlap with DM. Overall the union of these two Activity Groups has increased and both are doing well.

The activity group contains a healthy mix of student and non-student members, as well as US-based and non-US based members. Perhaps unsurprisingly for the area, over 80% of our members are from academia. There is room for improvement with regard to gender, as only 22% of our non-student members and 24% of our student members are women. The SIAM Engage platform remains active, with several posts per month on a variety of topics from a variety of individuals.

This year the DM conference is co-located with the general SIAM annual meeting, allowing for additional cohesion between Discrete Mathematics and other SIAM topics, as reflected in the programs of both meetings.

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

SIAM DM 22 was held in person at Carnegie-Mellon University in Pittsburgh, June 14-16, 2022, with Program Chairs Rob Morris and Sue Whitesides. The number of minisymposia and contributed talks was lower than in typical years. We believe this was due to lingering effects of the pandemic, including general uncertainty, travel restrictions, and Zoom fatigue, all of which may have contributed. We believe that attendance numbers for SIAM-DM22 will not be useful to predict attendance at future conferences since 2022 was likely an anomaly.

ACM-SIAM Symposium on Discrete Algorithms (SODA) 2023 and 2024 were held in Florence (Italy) and Alexandria (USA), respectively. This is the flagship conference in discrete algorithms, co-organized by SIAM and ACM. In addition to the main conference, we have two workshops: the SIAM Symposium on Algorithm Engineering and Experiments (ALENEX) and the SIAM Symposium on Simplicity in Algorithms (SOSA). There were 444 in person attendees at SODA 2023 and 328 at SODA 2024, with the majority being coauthors on one or more papers.

SIAM DM 24 will be held in Spokane co-located with SIAM AN 24, with Program Chairs Peter Keevash and Blair Sullivan. The program will contain 8 invited presentations and 25 minisymposia (14 invited and 11 contributed) in four days of activity. We expect that the number of attendees will considerably grow from SIAM DM 22, although it may be difficult to estimate whether this is because of the co-location with the SIAM annual meeting or just a return to the usual attendance number pre-pandemic. We note that Blair Sullivan is also currently the chair of the ACDA SIAG, so her leadership in the DM flagship conference has helped make these activity groups more cohesive.

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 of minisymposia at an annual meeting?

SIAM DM 24 will be jointly organized with SIAM AN 24. One of the invited speakers (Raghu Meka, UCLA, mentioned above his breakthrough on arithmetic progressions) was indicated by our SIAG. We will also have a track at SIAM AN 24.

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?

The SIAG awards the Dénes König Prize every two years to one or more early career researchers for outstanding research in an area of discrete mathematics, as evidenced by one key publication. The prize committee consists of 5 members of the SIAG, and is led by the Vice Chair of the Activity Group. The prize is well established in the community and SIAM received

many excellent nominations for the 2024 prize. The 2024 Dénes Kőnig Prize was awarded to Jinyoung Park and Huy Tuan Pham for their publication "A proof of the Kahn-Kalai conjecture".

The SIAM Engage platform for our activity group is active, with several posts per month on a variety of topics, largely advertising opportunities our members can take advantage of, including conferences, workshops, jobs, and mentoring. The SIAG has not been very active with SIAM News, although our communications liaison, Prasad Tetali, has requested articles on a couple of the recent advances on Ramsey Theory.

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

We plan to once again award the Dénes König Prize, after receiving several competitive nominations during our recent award cycle.

Our next conference will occur in 2026. Because the 2024 conference is collocated with the SIAM Annual Meeting, we are interested to see what effect this has on conference registration and attendance. This may inform decisions about where to host the 2026 conference; after low attendance in 2021 and 2022, choice of location should be carefully considered with an eye to encouraging attendance and participation.

We will continue to co-sponsor the ACM-SIAM Symposium on Discrete Algorithms (SODA). The activity group appoints two members to the SODA steering committee. These individuals, and the activity group as a whole, will continue to encourage participation of members of our activity group in SODA.

Jointly with the ACM-SIAM Symposium on Discrete Algorithms (SODA) Steering Committee, we have been laying the groundwork to create a new prize, the David S. Johnson SODA Test of Time Award. This will honor papers that appeared at SODA at least 20 years in the past and have significant and lasting impact, broadly defined. It will be awarded annually at SODA. It is modeled after similar awards given each year at FOCS (IEEE Symposium on Foundations of Computer Science and STOC (ACM Symposium on Theory of Computing). The current proposal includes a five-person prize committee, of which three must be members of our activity group. We hope this prize will be finalized soon to enable its first award to be given during the next period of the charter.

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

Due to unexpected delays, orientation for our leadership team was delayed several months, so we were not able to hit the ground running. We believe it would be helpful to identify a new nomination committee before the biannual meeting so that potential nominees can take part in the business meeting and other discussions before starting their terms. We are beginning to work on assembling this committee now, which is earlier than previous years. Revising the

timeline for new officers to give a larger grace period before taking over would allow for more engagement before the term starts, so we recommend more time between elections and the officer terms.

Last, the previous leadership team began discussions with SIGACT to try to define a reciprocity agreement between ACM and SIAM. We believe this would increase membership in the Activity Group and would benefit many members. Other incentives, such as discounts on journals for members, could also be helpful for increasing membership.

8. How can the activity group help SIAM in its general role of promoting discrete mathematics?

The SIAG helps SIAM in promoting discrete mathematics in the mathematical community through all its activities, in particular the SIAM Conference on Discrete Mathematics, and the prizes (Dénes König Prize and the future David S. Johnson SODA Test of Time Award). The SIAG promotes discrete mathematics within SIAM by organizing a number of minisymposia at the SIAM annual conference which have the purpose of building bridges with other areas.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2025.

Signed,

May 20, 2024

Dana Randall, Chair   Date Signed