SIAM DM renewal

May 2022

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 fourteen times thereafter. This SIAG has 439 members, including 173 student members, as of December 31, 2021. 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: Jeannette Janssen
- Vice Chair: Lenore Cowen
- Program Director: Prasad Tetali
- Secretary: Megan Owen

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? Please provide input here

Discrete Math continues to grow both in its core focus areas of extremal and probabilistic combinatorics, graph theory, and discrete probability, as well as in its interdisciplinary aspects. A prime example of the former is the STOC 2020 conference best paper featuring breakthrough results by Shachar, Lovett, and collaborators presenting substantial progress (after 60 years of little movement) on the Erdős-Rado Sunflower conjecture. This purely combinatorial question and the surrounding results have seen numerous applications already in communication complexity, matrix multiplication, and other topics in the theory of computing. The ideas in the proof inspired another major progress on the so-called Kahn-Kalai conjecture in random graph threshold phenomena, and the subsequent resolution of the conjecture in the affirmative. As a last example of the vibrancy of the field and its connections to other branches of mathematics, one could also cite the seminal works of June Huh and collaborators on the Rota conjecture and the resolution of Mason's conjecture, and the fast-developing topic of high-dimensional expanders, bringing together researchers from algebraic geometry, theoretical computer science, and discrete mathematics. Other significant developments include the recent substantial progress by Boáz Klartag and Joseph Lehec on the Kannan-Lovász-Simonovits conjecture.

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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?

Our activity group is doing well. We have a healthy number of student members, which indicates a younger generation ready to take over from the older ones. Having younger members also guarantees that the activity

group remains current and vibrant. The biannual conference is well-attended (exception for DM22 due to extenuating circumstances, see item 6) and remains the premium venue to learn about the most important developments in Discrete Math.

The DM AG is well-integrated within SIAM. The research specialty of our AG overlaps with that of other AGs. There is a special affinity with the new activity group on Applied and Computational Discrete Algorithms. The ACDA group covers similar topics to ours, but they are more focused on algorithm design, whereas our activity group focuses more on exploring the underlying theoretical properties of discrete objects and algorithms. The AG on Data Science also has an affinity with our group. The overlap lies in the analysis of large networks such as online social networks, in graph algorithms that can form kernels of machine learning algorithms, and in discrete optimization. Finally, the connections with the AG on Algebraic Geometry have strengthened with recent developments on high-dimensional expanders and related topics.

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 Conference on Discrete Mathematics 2021 (SIAM-DM21). This meeting was originally planned for June 2020 but was cancelled due to the pandemic. The meeting was held virtually in July 2021, co-located with the Annual Meeting and ACDA/CT/OPT. Program chairs were Alan Frieze and Asaf Shapira. This was SIAM's first virtual paid meeting. There were 151 participants.*

- *SIAM-DM22. This conference will be held in-person only at Carnegie-Mellon University in Pittsburgh, June 14-16. Program Chairs are Rob Morris and Sue Whitesides. The conference was originally scheduled to be hybrid and take place at a hotel near Pittsburgh. However, the number of minisymposia and contributed talks is much lower than in typical years, so lower than usual attendance is expected. We believe this is entirely due to the pandemic: the uncertainty, travel restrictions, and 'zoom fatigue' may have all contributed, as well as the fact that the conference is only one year after the postponed SIAM-DM21, whereas the community expects a 2-year cycle. Also, this summer there are many competing conferences on topics related to DM.*

  The program officer and program chairs, together with SIAM, decided to move the conference to CMU and hold it in-person only. The local organizers are Prasad Tetali, department Chair at CMU, and Po-Shen Loh, a discrete mathematician at CMU. Po-Shen has been a tremendous help, using his contacts and discretionary funds to obtain local rates for conference rooms etc. We expect a successful conference, the first opportunity for the community to come together in-person after the start of the pandemic. However, we do not believe attendance numbers for SIAM-DM22 will be useful for predicting attendance at future conferences: this year will be an anomaly.

  ACM-SIAM Symposium on Discrete Algorithms (SODA). Our activity

group nominates two members of the steering committee of SODA. During these past two years, we appointed Blair Sullivan, replacing Pavol Hell, and Sang-il Oum, replacing Dan Kral. The new appointees are leaders in the field whose research straddles Discrete Math and CS. Their appointment increases the diversity of the steering committee.

- *Due to the COVID-19 pandemic, SODA 2021 was held online in January 2021. The Discrete Math community was well-represented, with Maria Chudnovsky giving a keynote presentation on minimal separators. Daniel Marx chaired the Program Committee. The conference saw a notable drop in submissions this year, which was believed to be primarily driven by a conflict with the FOCS deadline (preventing authors rejected from one to submit to the other) due to a shift in the FOCS dates; this will be addressed in future. The acceptance rate was still around 28%. The steering committee received concerns related to the registration fees, which the SIAG perceived to be high for an online meeting. Some suggested that the absence of significantly reduced registration fees for non-speakers was a missed opportunity to attract an additional audience to the conference without an increased cost on the organization side and, generally, for SIAM to promote itself in the community.*
- *SODA 2022 was scheduled to be held as a hybrid meeting in Alexandria, Virginia, in January 2022. Unfortunately, due to a new wave of the pandemic, and based on input from the Steering Committee, SIAM cancelled the in-person component in late December. The conference was held simultaneously with ALENEX, SoSA, and APOCS. Seffi Naor chaired the Program Committee. One notable change to the meeting was that for the first time, paper submissions were anonymized and underwent (lightweight) double-blind review. This was implemented to reduce bias in the review process and has become common at several other TCS conferences and SIAM meetings (and, more recently, AMS journals). There were several interesting talks on discrete mathematics topics, including a keynote by Jacob Fox on the use of randomized results from regularity in property testing. Many other topics in discrete mathematics were represented in the list of the accepted papers, including r-minor valued matroids, upward planar graphs, and several tree-decomposition-related works (list homomorphisms, directed tangles). In 2022, there continued to be a significant discussion among the steering committee about registration fees (especially in light of an online meeting); the committee is also actively working with SIAM to establish a Test of Time award for the meeting (including rules for serving on the selection committee, and award eligibility).*

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? (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.)

SIAG/DM had a Track with 12 minisymposia at SIAM/AN17 in Pittsburgh. The track was organized by our vice-chair Lenore Cowen. Our AG did not organize any session or minisymposium at AN21, but DM21 was co-located with this meeting. Our AG aims to organize a track at AN24 (see below).

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?

- *Our activity group awards the Dénes König prize. This is a biannual prize awarded to an early career researcher. The most recent prize committee was composed of Anthony Bonato, Henry Cohn, Lenore Cowen (chair), Dan Kral, and Joel Spencer, and the 2022 winner will be announced when the prize is awarded at the SIAM Conference on Discrete Mathematics.*
- *The business meeting of the AG was held virtually during SIAM-DM21. The meeting was accessible to members regardless of registration for the conference. Participation was good; attendance was comparable to that of in-person meetings.*
- *We are using SIAM Engage for our mailing list. There are 350 members registered in the community, and there have been 46 discussion threads since the beginning of 2021, when we switched to SIAM Engage. The number of members on Engage has been steadily rising. We will use Engage to distribute the AG newsletter.*
- *The AG appoints a SIAM News liaison. The liaison informs the SIAM News staff of new developments in DM and suggests themes for articles. Dorit Hochbaum served until 2022; our program officer Prasad Tetali will take over the role in the future.*

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

- *SIAM-DM24. It is important to ensure that attendance levels at DM24 will return to pre-pandemic levels, i.e., around 300 attendees. A discussion should be had about the format: conferences are bound to change in a post-pandemic world. The experiences from this year with SIAM conferences and other conferences will give insight into what works best. One way to boost attendance would be to co-locate the DM meeting with the meeting of the ACDA AG. However, this would require some planning since currently, the ACDA meetings are held biannually in the odd years, while DM takes place in even years. Another idea is to hold the conference outside North America. Asia and Europe have many active researchers in discrete math. Holding the conference there would bring in a new audience. It would also help recognize these communities. Extending the reach of the conference will also help increase diversity.*
- *We will recommend to the next officers to co-locate DM24 with AN24. Regardless of whether or not DM24 ends up co-located with AN24, the activity group plans to organize a track at AN24. The track at AN24 should focus on the significant contributions of discrete math to other areas of industrial and applied mathematics.*
- *The SIAM DM meetings are held in even years. In odd years, the major*

discrete math conference is CanaDAM. We aim to approach the CanaDAM steering committee to discuss ways in which the two meetings can benefit each other.

- *The activity group will co-sponsor SODA in 2023 and 2024. The AG appoints two members to the SODA steering committee. We have most recently appointed Blair Sullivan and Sang-Il Oum in these roles. The newly appointed steering committee members are dedicated to increasing the participation of members of our activity group in SODA. The new officers are encouraged to keep in close contact with Blair Sullivan and Sang-Il Oum and discuss ways to bring this about.*

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

Our activity group is and remains one of the smaller activity groups. We believe that the membership may not adequately reflect the size of our community. Discrete Mathematics is a research topic that overlaps with mathematics and theoretical computer science. Discrete mathematicians that consider themselves part of the CS community may opt for membership in ACM instead of SIAM. We have recently sought contact with officers Valerie King and Chris Umans from the SIGACT group of the ACM and asked if they would support a reciprocal agreement, whereby researchers would be able to join both ACM and SIAM at a discounted rate. Their reaction was very positive; they will put this suggestion forward at their next meeting. In discussion with SIAM leadership, they have also expressed their willingness to pursue such an agreement. We hope that this will come about in the next term of the AG. We are sure such an agreement will benefit the community and strengthen the activity group.

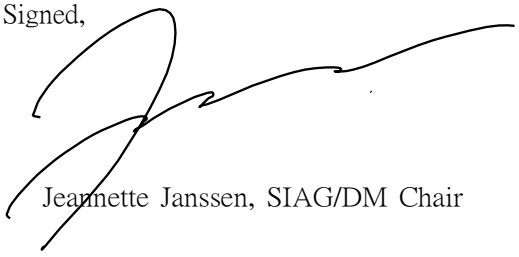
We are happy with SIAM's focus on equity and diversity. The activity group strongly supports SIAM's goals in this respect. We hope SIAM will be able to help us contact traditionally underrepresented communities and attract researchers from a variety of backgrounds.

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

Through our SIAM News liaison, we will suggest topics related to our AG for SIAM News. We will organize a track at AN24 and make sure the topics presented are of interest to a broad audience of applied mathematicians. We will encourage our members to send in a proposal for the Gene Golub summer school on a topic in discrete mathematics. We will encourage members of the discrete math community to join SIAM.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2023.

Signed,



May 26 20

Jeannette Janssen, SIAG/DM Chair [DATE SIGNED]