

## **SIAM Activity Group Uncertainty Quantification Charter Renewal Application**

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Uncertainty Quantification. The SIAM Activity Group (or SIAG UQ) to which this renewal applies was originally formed under the aegis of SIAM in December 2010 by the SIAM Council and by the SIAM Board of Trustees with its initial operating period beginning December 11, 2010 and ending December 31, 2012. Its charter has been renewed by the Council and Board six times thereafter.

This SIAG has 583 members, including 193 student members, as of April 1, 2024.

According to its Rules of Procedure, the objective(s) of the SIAG are:

- It is the purpose of the SIAM Activity Group on Uncertainty Quantification to foster activity and collaboration on all aspects of the effects of uncertainty and error on mathematical descriptions of real phenomena. It seeks to promote the development of theory and methods to describe quantitatively the origin, propagation, and interplay of different sources of error and uncertainty in analysis and predictions of the behavior of complex systems including biological, chemical, engineering, financial, geophysical, physical, and social/political systems. The SIAG serves to support interactions between mathematicians, statisticians, engineers, and scientists working in the interface of computation, analysis, statistics, and probability.
- Together with its partner UQ Interest Group in ASA, the SIAG organizes a biennial conference, sponsors minisymposia at conferences, publishes a newsletter biannually, and maintains an electronic discussion group.

Within the framework of SIAM, the SIAG will conduct activities that implement its purposes. The SIAG on Uncertainty Quantification will organize activities in uncertainty quantification.

The SIAG is expected to:

1. Organize minisymposia at the SIAM Annual Meeting 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 Uncertainty Quantification. 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, and conduct special one- or two-day meetings immediately before or after a regular SIAM meeting. 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: Amy Braverman

Vice-Chair: Adrian Sandu

Program Director: Claudia Schillings

Secretary: Emil Constantinescu

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?

Uncertainty Quantification (UQ) as a recognized discipline continues to grow in academia, industry, and policy making. The UQ community was originally an outgrowth of applied mathematics' efforts to quantify uncertainties on the outputs of deterministic models. Meanwhile, the statistics community focused on inference from data, but for some time there has also been an interest on treating the output of deterministic models (e.g., climate models) as "data" (i.e., design and analysis of computer experiments). In the last few years the two threads have woven together in a particularly exciting way. Within the UQ discipline the lines between the four areas are disappearing as researchers and practitioners draw on whatever combination of techniques are most powerful for solving their problems. One of the great strengths of the UQ community is that both theoretical and applied work remains driven by real-world applications. This brings community members together across disciplinary lines in a way and to an extent that is uncommon at least in academia.

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 activity group is healthy and growing. The pandemic took a toll, but SIAM UQ24 energized the community. Prior to the conference, the SIAG had 390 members, 120 of which were students. As of April 1, 2024 (after the conference) the SIAG has 583 members, 193 of which are students. UQ ranks seventh among the 22 SIAGs in size. The SIAG is keeping up with changes in the field with the incorporation of more members with interests in machine learning and other data science topics. However, diversity on multiple axes remains a problem. Three-quarters of our members are male, for both students and non-students. 76 percent of SIAG members are academics; mathematics departments account for half the membership, and engineering departments for an additional quarter. Statistics departments and Computer Science departments only account for about seven percent each. As a step towards remedying this situation, the SIAG UQ leadership and the SIAM UQ24 Program Committee, appointed Drs. Daniela Calvetti, Annalisa Quaini, and Gianluigi Rozza as organizers of the "Power of Diversity in UQ" (PODUQ) meeting- a satellite event of SIAM UQ24. PODUQ's intent was to showcase the contributions of a diverse set of researchers, and reach out to students and other junior members to make clear that UQ is a welcoming community that cares about mentoring. PODUQ was attended by more than 80 people, and included a panel discussion on challenges, and a student poster session.

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

The activity group sponsored SIAM UQ24 in Trieste, which was highly successful. It attracted more than 1000 participants: the highest of any SIAM UQ meeting thus far. The activity group also sponsored PODUQ, which was also highly successful in establishing SIAG UQ's dedication to diversity in the community. We note that, for both meetings, the infusion of extra money from external sponsors (procured from local industry in the case of SIAM UQ24, and NSF in the case of PODUQ) was crucial in creating an atmosphere conducive to technical and personal interchange. The amenities brought by these extra funds elevated UQ24 as a desirable, well-run conference, and elevated PODUQ by showing its attendees that the community cares about them.

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?

SIAG UQ last organized a track at the annual meeting in 2017. We have discussed with SIAM the possibility of organizing a track at AN25 in Montreal, but no further information from SIAM has been forthcoming from SIAM.

*\*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.\**

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?

Discussions across SIAG UQ are carried out through SIAM Engage. In the past year and a half, there have been around 300 postings, mostly job advertisements. SIAM Engage is closed to the SIAM UQ community, and only members of SIAGs can see posts from the specific SIAGs. This limits the outreach on the one hand; on the other, it provides a platform for having focused topical discussions isolated from public distractions. Unfortunately, we feel this platform is underutilized. One potential use of SIAM Engage is to connect students and early career researchers seeking answers to difficult problems to senior scientists.

The activity group sponsors an Early Career Prize every two years. This year's winner is Jonas Latz from the University of Manchester. His award was presented at SIAM UQ24.

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

During the next period of the charter (2025-2026) the SIAM will organize its next UQ conference, UQ26. This will, of course, require selecting a venue (under discussion now), program chairs, a program committee, and making plans to repeat the PODUQ event. Other than the venue, this will be the responsibility of the next SIAG UQ leadership team. We hope

that team will continue to emphasize synergy across UQ's sub-disciplines, and remedying the diversity imbalance in our membership.

Two other activities in the 2025-2026 timeframe are planned: a session on UQ at the Joint Mathematics Meetings (JMM) in Seattle in January 2025, organized by Amy Braverman at the request of SIAM, and a UQ track at the SIAM Annual Meeting in 2025 as discussed in item 4 above.

We suggest at least one additional activity: SIAG UQ should organize an invited session at the Joint Statistical Meetings (JSM) in 2025. This will require reaching out to ASA (the American Statistical Association- a co-sponsor of SIAM UQ conferences) to secure an invited session. This is a direct way to recruit more statisticians into SIAG UQ. The session should emphasize the cross-disciplinary, applications-oriented nature of the SIAG and the UQ conferences, and the session should showcase the exceptional technical quality our membership has to offer.

We also suggest that the new leadership team reach out to other professional societies in other domains, especially computer science and data science, to engage through invited sessions at their conferences.

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

SIAM can help the SIAG achieve its goals in a number of ways: 1) SIAM can encourage and facilitate more interchange with other professional societies, and help secure invited sessions on UQ, organized by the SIAG at other professional societies' meetings. 2) SIAM can encourage and facilitate more interchange with other SIAGs. There is clearly overlap with CSE, for example. There is also some technical overlap with DS, which could be exploited with, say, some attention to the role of machine learning in UQ and the role of UQ in machine learning. MPE is an obvious place where there is a need for UQ, and an interest by UQ. 3) SIAM can do more to help UQ reach out to external sponsors for our conferences. UQ24 was the success it was partly because of external funding. We know SIAM has a mechanism for soliciting co-sponsorship funds, but its role in SIAM UQ24 is unclear. The difference-making external funding was acquired by the local organizer, and by the PODUQ program chairs. 4) SIAM can take a more affirmative role in recruiting members of under-represented groups to join SIAG UQ. For example, SIAM can broker a meeting between the SIAG UQ and DEI activity group leadership to discuss how they might work together to further the goals of both. 5) SIAM can ensure that PODUQ becomes a permanent event ahead of future SIAM UQ conferences.

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

The activity group can help SIAM in its general mission of promoting applied mathematics and computational science by encouraging SIAG UQ members to get involved in the suggested activities in item 7 above. To the extent that SIAM has activities that directly target industry, SIAG UQ members could also get involved in those activities. We are aware of no such initiative by SIAM, however. SIAM may also wish to consider whether some outreach to policy makers is worthwhile at this time. The pandemic served to illustrate why quantitative decision making is important, and more could be done in this area. SIAG UQ could play an important role in the enterprise.

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

A handwritten signature in black ink, appearing to read "Amy Braverman". The signature is fluid and cursive, with a long horizontal stroke at the end.

Amy Braverman, SIAG/UQ Chair

May 1, 2024