

CHARTER RENEWAL APPLICATION

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Computational Science and Engineering (SIAG/CSE). The SIAG/CSE was originally formed under the aegis of SIAM by the SIAM Board of Trustees on December 2, 2000, followed by the SIAM Council on December 15, 2000, with its initial operating period beginning January 1, 2001 and ending December 31, 2003. Its charter has been renewed by the council and by the board continuously since its inception (2004-2006; 2007-2008; 2009-2010; 2011-2012). This SIAG has 2359 members as of December 2011.

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

- Foster collaborations among applied mathematicians, computer scientists, domain scientists and engineers in those areas of research related to the theory, development, and use of computational technologies for the solution of problems in science and engineering.
- Promote and facilitate Computational Science and Engineering as an academic discipline.
- Promote computational simulation as a peer to theory and experiment in the process of scientific discovery.

Within the framework of SIAM, the SIAG/CSE will conduct activities that implement its purposes. Its proposed functions are:

- 1) Organize minisymposia at the SIAM Annual Meeting on years where there is no SIAG conference.
- 2) Organize a track of at least six minisymposia at the SIAM Annual Meeting at least once every five years. The SIAM Vice President for Programs and the SIAM Vice President at Large will coordinate the scheduling with the SIAG/CSE Chair.

Other activities can include:

- 3) Organize a biennial SIAM Conference on Computational Science and Engineering. 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 Chair of the SIAG/CSE or their designee. The organizing committee must be approved by the SIAM Vice President 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. Other SIAG meetings may be organized only with the approval of the SIAM President and Vice President for Programs.
- 5) Broker partnerships between academia, industry, and government laboratories. The SIAG will seek to facilitate the establishment of academic programs in CSE to foster its development as an academic discipline. The SIAG also will facilitate the placement of undergraduate and graduate students in internships in industry and government laboratories.
- 6) Work with other societies to promote CSE. The SIAG will work with other professional societies to promote CSE. For example, SIAM and another society might organize a workshop on a topic of mutual interest. The SIAG also would attempt to increase government support for CSE through various outreach activities.
- 7) Disseminate information. The SIAG may publish a newsletter, offer a members' list serve or maintain a website to facilitate the exchange of information among its members and other interested parties.

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.

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 three years?

Computational science and engineering (CSE) continues to grow as a field. In the physical sciences such as physics, chemistry, environmental sciences, material sciences and the biological sciences, simulation has become a critical tool that contributes to scientific discovery in combination with theory and experimentation. CSE is also increasingly playing a fundamental role in engineering and new areas of CSE in engineering are emerging. Moreover, CSE is becoming a strong area in the social and information sciences. As with the traditional areas of CSE, these new growth areas are utilizing advancements in CSE to advance discovery in their discipline and also driving the development and need for new methodologies in CSE.

In the last couple of years, we have seen validation, verification, and uncertainty quantification (VVUQ) develop into more mature research directions and valuable computational components, and the CSE SIAG and its members has played a major role in promoting these new areas. The result has been the formation of a new SIAG in VVUQ encouraged by the CSE SIAG. The mathematics and computing strategies continue to progress in these areas, and will be instrumental as VVUQ continues to grow and impact scientific and policy decisions.

Another area of recent growth in CSE is in emerging architectures. CSE continues to be the medium for advancing mathematics, computation, and application in new architectures and motivating the design of next generation machines. The SIAG has been a strong supporter of high-performance and parallel computing in this context.

As a field, CSE is also becoming more data and information driven. From applications in the social sciences, to health sciences, to the core physical sciences, vast amounts of data are now available and driving computation. In coming years, data and information will continue to integrate in the field of CSE and advancements in the mathematics, computer science, algorithms, and implementation of this will be a strong area of growth.

The opportunities in and demand for CSE solutions are growing in academia, government, and industry, and the state of the field is strong.

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 continues to grow. Membership has increased by 11.5% from 2115 members in 2009 to 2359 members in 2011. Around 58% of this membership is student membership, which gives a promising outlook for the field. Moreover, while the membership consists of (non-students) around 63% from academia, we have over 15% membership from each of government and industry. Likewise, 27% of the membership outside the US, indicating a strong global presence of the SIAG. Female membership remains at around 11%, however over 18% of the students are female.

One of the main activities of the SIAG is the biannual CSE conference. Through this highly active conference we keep the SIAG current to trends in the field and help foster newly emerging areas. For example, at the SIAM CSE11 conference, the invited speakers brought a range of expertise in a vast number of applications areas, from large scale architectures, to uncertainty quantification, to simulation based engineering. The conference remains attractive to the membership because it invites a broad range of participation, while focusing on the advancements

and impact of CSE. The attendees are able to showcase their work to a variety of related areas that would otherwise not interact, and they are able to see new ideas in new areas at the forefront of CSE.

SIAM strengthens the interactions between mathematics and science and technology. The CSE SIAG is an excellent forum for these interactions, particularly through its conference series. In the past several years, we have strived to maintain a balance on the organizing committees with applied mathematicians, computer scientists, and application scientists. This has been valuable in reaching out to different communities and ensuring the multidisciplinary nature of the SIAG.

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 Conference on CSE, February 28-March 4, 2011, Reno, NV had 843 attendees.

The SIAM CSE conference series continues to be successful. CSE11 saw a growth of 13%. The conference continues to have a large number of minisymposia, however one feature at CSE11 was the highly popular “Poster Blitz” as an alternative to contributed talks. This was first tried at the CSE09 Conference and significantly expanded at CSE11. The feedback on the format was very positive and helped add more variation to the standard lecture format. The conference awarded the 3rd annual BGCE student prize (see link below).

One of the continuing problems of the success of the CSE conference is the size. The number of minisymposia is high, although the introduction of the poster session helped to alleviate this somewhat. One factor contributing to the high number is the high number of multiple talks given by a single attendee.

Another ongoing struggle with the conference is how to pick up on the ending of the SciDAC meetings. This has been discussed amongst the CSE SIAG Officers and the CSE Chair has provided input to the SIAM Managing Director and others. However, interactions with the Managing Director as of April 2012 indicate that SIAM is still waiting on feedback from DOE.

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?

ICIAM 2011 Conference:

The SIAG CSE officers helped organize a series of Industrial Minisymposia at the ICIAM 2012 Conferences. There were 6 minisymposia in the area of Finance and Risk Management. In the area of Imaging and Inverse Problems there were 6 minisymposia. In addition, there were 2 minisymposia devoted to Graduate Research Internships with Industry. This was a total of 14 minisymposia partially organized by the CSE SIAG.

Minisymposia Track at Annual Meeting:

The last CSE SIAG organized track of minisymposia at the SIAM annual meeting was in SIAM AN08. The next annual meeting at which the CSE SIAG is expected to organize track of minisymposia is SIAM AN14 (the annual meeting in 2014). As the organization of the SIAM Annual Meeting for 2014 is yet to be organized, there is little information at this time.

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

The other activities sponsored by the activity group include the CSE mailing list, a SIAG Wiki, and articles in SIAM news and SIAM Review.

- CSE Mailing List. The CSE mailing list is open to all SIAG members who are automatically subscribed when they join the SIAG. We encourage the following types of postings to the mailing list: solicitations

for SIAG/CSE sponsored conferences, announcements of CSE-related conferences/events, calls for nominations of prizes, new technical reports, papers, software, open positions, and SIAM announcements such as electronic publication, general conference announcements and other news. The list is now fully moderated in order to prevent redundant or inappropriate posts. Information on the list can be found at <http://lists.siam.org/mailman/listinfo/siam-cse>

- SIAG Wiki. The CSE SIAG established a Wiki where information relevant to the field can easily be exchanged. Appropriate material for posting includes listings of upcoming meetings of interest to the field, presentation slides from CSE meetings, links to external relevant pages, business meeting notes, etc. The wiki was updated substantially in the last two years with new information and a new format.
- SIAM News. The SIAG contributed an article on the CSE11 and several of the plenary speakers contributed articles on the conference:
[CSE 2011: SIAG/CSE Holds Milestone Meeting in Reno](#)
[CSE 2011: Data-driven Art: Building Computational Models of the Face](#)
[CSE 2011: Bayesian Calibration, Validation, and Uncertainty Quantification for Models of Tumor](#)

Growth

[CSE 2011: Third BGCE Student Prize in CSE Awarded in Reno](#)
[CSE 2011: Data: A Centuries-old Revolution in Science, Part I](#)
[CSE 2011: Biomolecular Modeling and Simulation: The Productive Trajectory of a Field](#)
[CSE 2011: Data: A Centuries-old Revolution in Science, Part II](#)

- In addition, SIAG Chair co-authored an article for SIAM News “Through a New Looking Glass: Mathematically Precise Visualization, SIAM News, Vol. 43, no. 5, June 2010.”
- The SIAG contributed an article in SIAM Review: Undergraduate Computational Science and Engineering Education, SIAM Review, Vol. 53, no. 3, September, 2011

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

Plans for the CSE13 conference are underway. The conference co-chairs are Karen Willcox and Hans Petter Langtangen. The conference will be in Boston from February 25 – March 1, 2013 with the following themes:

Multiphysics and Multiscale Computations
Identification, Design, and Control
Surrogate and Reduced-order Modeling
Verification, Validation, Uncertainty Quantification
Discrete Simulations
Scientific Data Mining
Scalable Algorithms for Big Data
Simulations on Emerging Architectures
Exascale Challenges
Scientific Software and High-Performance Computing
Applications in Science, Engineering, and Industry
Computational Mathematics of Planet Earth
CSE Education

CSE13 will be held in Boston, an area with a large number of academic institutions in close proximity. In response, the SIAG will make a special effort to encourage a large student attendance from these institutions. The SIAG Officers have already started contacting colleagues in the area to encourage their undergraduate and graduate students to attend the conference.

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

SIAM can best help the CSE community by continuing to promote CSE and to encourage increased funding from federal agencies that traditionally have had difficulty supporting the interdisciplinary research essential to CSE.

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

SIAM continues to be the professional society for CSE. Applied mathematics is integral to the community and continues to grow. This SIAG is a medium for professionals to gain information about trends and the edge of research through the CSE conference series and list serve. As we see more subfields emerge in CSE this will contribute to SIAM's membership base and breadth. Moreover, this multidisciplinary SIAG will expose a wide range of professionals to applied mathematics.

The CSE SIAG has been instrumental in fostering research in new areas and supporting growth in related subfields. The CSE SIAG has helped other SIAGs such as Uncertainty Quantification and Imaging Sciences develop into full activity groups, and the CSE SIAG will continue to promote similar efforts as they emerge.

The SIAG could take a more active role in helping SIAM promote CSE education. There has been some activity in the past year on surveying CSE education, however the SIAG could take a more active role in promoting academic activity as far as curriculum and trends. A CSE education subgroup could be well served to help direct specific issues to the SIAM Education committee as CSE will be an area of growth in colleges and universities.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2013.

Signed,



Kirk E. Jordan
CSE SIAG Chair
May 29, 2012