

# The SIAM Activity Group on Applied and Computational Discrete Algorithms (ACDA)

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# SIAG on ACDA

- The beginning:
  - We took steps in 2018 to form a [SIAM Activity Group](#) on ACDA, the culmination of a decade of growing applied discrete mathematics and algorithms within SIAM
  - [Bruce Hendrickson](#) (Livermore National Lab) was a leader in this effort.
  - [Combinatorial Scientific Computing \(CSC\)](#) community had been formed in 2004, and nine SIAM and international workshops had been held biennially.
  - CSC was organized under the aegis of SIAM, but had a loose relationship with SIAM, since it was felt that we needed more freedom to organize our workshops (locations and times), and grow our community.

# SIAG on ACDA

- The beginning:
  - The CSC Workshops represented an experiment that succeeded. It showed us that there was a need for this research community, and there was support from SIAM for applied and computational discrete algorithms.
  - SIAM had felt a need for a home for applied and computational discrete algorithms, the SIAG on Discrete Mathematics has been stronger in pure discrete math.

# SIAG on ACDA

- The beginning:
  - CSC had included the sparse matrix algorithms, automatic differentiation and parallel computing communities since its inception in 2004.
  - The goal of ACDA was to broaden the community beyond CSC, to combinatorialists working in theoretical computer science, applied discrete math, algorithm engineering, combinatorial optimization, bioinformatics algorithms, data science, machine learning, systems, etc.

# SIAG on ACDA

- The beginning:
  - The initial leadership team, the PC and Organizing committees of the first ACDA conference, were all formed with this perspective on broadening the community.
  - Still a work in progress. We need to look for opportunities to grow the ACDA community, taking care to maintain its breadth while preserving reputation and quality.
  - The SIAM Engage portal is a forum for discussions; it is under-utilized since it requires login to the SIAM portal and more key clicks to find it.

# SIAG on ACDA

- ACDA gives us opportunities to grow
  - Currently 450+ members in ACDA, still one of the smaller SIAGs
- We expect that the reputation of the ACDA conference will grow the community over time (see the development of SODA and its workshops, e.g., ALENEX).
- Important to identify emerging areas where combinatorics plays a key role.

# SIAG on ACDA

- Publications
  - The last several of the CSC Workshops had published SIAM Proceedings.
  - Hybrid SIAM model for conferences, where reviewed papers are in Proceedings, but speakers can give talks based on selected extended abstracts.
  - ACDA conferences in 2021 and 2023 follow that model.
  - One challenge is to grow the community so that an [annual](#) conference can be sustained with good publications. (Again, see SODA.)

# ACDA Activities 2019-2020

- Organized the First SIAM Conference on Applied and Computational Discrete Algorithms, July 2021, co-located with SIANN. Chairs of OC: [Bruce Hendrickson](#) and [Blair Sullivan](#), and Chairs of PC: [John Gilbert](#) and [Michael Bender](#).
- ACDA [Early Career Prize](#) was established; the prize will be awarded for the first time at ACDA 2023.
- Organized an ACDA Plenary talk at SODA 2020: [David Shmoys](#), Models and algorithms in support of modern urban mobility, with a reception following.
- A SIAM Blog article was written on the formation of ACDA.
- Elected new ACDA officers for the 2021-2022 period.



# ACDA Activities 2019 - 2020

- SIAG formed with the initial set of officers:
  - Alex Pothen, Chair
  - Blair Sullivan, Vice-Chair
  - John Gilbert, Program Director
  - Cindy Phillips, Secretary
- Organized a list-serv, SIAM Engage Portal.
- @siam\_acda on Twitter. Follow us!
- Sponsored the new [SIAM Symposium on Algorithmic Principles of Computer Systems \(APOCS20\)](#) collocated with SODA.
- Organized minisymposia (describe) on topics of interest to the SIAG at conferences such as ICIAM (Valencia, July 2019) , SIAM CSE (Spokane, March 2019), SIAM Annual (July 2020).
- SIAM News article on ACDA talks at SIAM CSE 2019, written by Bora Ucar, Ariful Azad.

# ACDA Activities 2021 - 2022

- SIAG formed with the first set of elected officers:
  - Cindy Phillips, Chair
  - Henning Meyerhenke, Vice-Chair
  - Uwe Naumann, Program Director
  - Bora Uçar, Secretary
- SIAM News article November 2021 recapping the Inaugural 2021 SIAM Conference on Applied and Computational Discrete Algorithms.
- Formed prize committee for ACDA early-career prize to be awarded at ACDA 2023
- Minisymposia at CSE21 and PP22
- ACDA online seminar series (committee Uwe Naumann, Blair Sullivan, Julian Shun, Anne Benoit) – recordings on YouTube
  - Kathy Yelick (UC Berkeley), December 2021, “Genomic analysis at scale: mapping irregular computations to advanced architectures”
  - Monika Henzinger (U. Vienna), May 2022, “Dynamic Graph Algorithms and their implementation

# ACDA 2021

- Moved to fully virtual
- Introduction Blitz
- Minitutorials
  - Introduction to Combinatorial Scientific Computing (Rob Bisseling, Henning MeyerHenke, Uwe Naumann)
  - Combinatorial Frontiers in Computational Biology (Lenore Cowen, Christine Heitsch)

# ACDA 2021

## Industrial Problems Session

- **Performance Analysis of HPC Applications** *Michael A. Frumkin*, NVIDIA, U.S.
- **Mixed Integer Programming - A Confluence of Algorithms** *Edward Rothberg*, Gurobi Optimization, U.S.
- **What's left in dictionary design?** *Rob Johnson*, Vmware Research, U.S.
- **Next Generation of Parallel and Distributed Graph Mining Algorithms: Theory and Practice** *Vahab Mirrokni*, Google, Inc., U.S.

# ACDA 2023

- May 31-June 2, 2023 Seattle, WA, USA
- Co-located with SIAM Optimization
- Overall co-chairs: Uwe Naumann, Lenore Cowen
- Program committee chairs: David Shmoys and Jon Berry

# SIAG on ACDA

- Journal?
  - Currently the CSC community publishes in SISC, SIMAX, and SIAM Mathematics of Data Science.
  - It is not clear that ACDA work would flourish in the current SIAM Journal of Discrete Math, or SIAM Journal of Computing (SICOMP).
  - The current trend in computer science (at least in the more applied areas) is to de-emphasize journal publications to privilege conference publications.
  - However, several of the CS, AI, ML conferences have grown so large that it is difficult to find a sufficient number of high quality reviewers.
  - The time pressure of conferences also contributes to some excellent submissions being rejected while others of lower quality being accepted.

# SIAG on ACDA

- Questions?
- Comments, Suggestions are always welcome!

# SIAM CSC Workshops

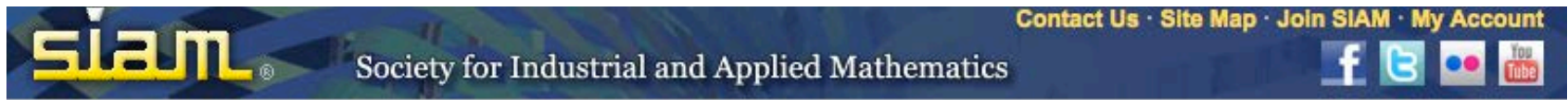
## A trip down memory lane



- First SIAM Workshop on CSC, San Francisco, Feb 27-28, 2004
- OC: Bruce Hendrickson, John Gilbert, Sivan Toledo, Horst Simon, Alex Pothén
- Insert a picture of the Golden Gate bridge.



# CSC04, San Francisco, co-located with SIAM PP



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## First SIAM Workshop on Combinatorial Scientific Computing

December 26, 2004

Alex Pothén and Bruce Hendrickson

Scientific computing is traditionally viewed as the province of continuous mathematics, of differential equations and linear algebra. Many combinatorial subproblems, however, arise in the solution of scientific computing problems. "Combinatorial scientific computing," a recently coined label for interdisciplinary research involving discrete mathematics in scientific computing, refers to the development, analysis, and application of combinatorial algorithms to solve problems in computational science and engineering.

### Sparse Matrices Among Themes at CSC Workshop

The name may be new, but combinatorial scientific computing has been an active research area for decades. Thus far, however, researchers in CSC have been isolated in subcommunities delineated primarily by the application areas in which they work.

No longer! To build a community of researchers in combinatorial scientific computing, and to provide a forum for discussion and collaboration, SIAM sponsored the Workshop on Combinatorial Scientific Computing (CSC04), held in San Francisco, February 27 and 28, immediately following the 11th SIAM Conference on Parallel Processing for Scientific Computing. The workshop was organized by John



Alan George was recognized at the workshop for pioneering contributions to the field of combinatorial scientific computing.

## CSC05

**Second International Workshop on Combinatorial Scientific Computing (CSC05)**  
**June 21--23th, 2005 at CERFACS, Toulouse, France**

In cooperation with



The Second International Workshop on Combinatorial Scientific Computing (CSC05) will provide a forum for researchers interested in the interaction of combinatorial mathematics and algorithms with scientific computing to discuss current developments in research.

CSC05 follows the pioneering SIAM Workshop on Combinatorial Scientific Computing (CSC04) held at San Francisco in Feb 2004. The CSC04 Workshop, attended by close to a hundred participants, featured three plenary talks and 21 selected talks on the themes of sparse matrix computations, high-performance algorithms, combinatorial problems in optimization and automatic differentiation, mesh generation, computational biology, and combinatorial matrix theory. The CSC05 Workshop aims to bring together researchers interested in these themes as well as other aspects of combinatorial mathematics and algorithms in scientific computing, broadly interpreted. Researchers in emerging application areas as well as theoretical areas that intersect with combinatorial scientific computing, e.g., information science, networks, bioinformatics, and combinatorial optimization, are invited to participate.



# 2007: SIAM CSC Workshop

## **The SIAM Workshop on Combinatorial Scientific Computing (CSC07)**

February 17 - 19, 2007

Costa Mesa, CA

Sponsored by the [SIAM Activity Groups on Computational Science and Engineering](#) and [The SIAM Activity Group on Supercomputing](#)

Supported by the [Department of Energy](#) and [Old Dominion University](#).

Combinatorial algorithms play a crucial enabling role in computational science and engineering (CSE), and as problems and data sets increase in size and complexity, this role continues to grow. To provide a forum for researchers interested in the interaction of combinatorial mathematics and algorithms with CSE, the SIAM Workshop on Combinatorial Scientific Computing (CSC07) will be organized in Costa Mesa, CA, on Feb 17-19, 2007. The CSC07 workshop will precede the 2007 SIAM Conference on Computational Science and Engineering, and is organized in co-operation with the SIAM Activity Groups on Computational Science and Engineering, and Supercomputing.

60<sup>th</sup> birthday of Iain Duff was celebrated.

## CONFERENCES >

### SIAM Workshop on Combinatorial Scientific Computing (CSC09)

The CSC09 workshop will start on Thursday 10/29 at 1:30 pm and end early afternoon on Saturday 10/31.

**October 29-31, 2009**

**Embassy Suites Hotel Monterey Bay - Seaside**

Combinatorial algorithms play a crucial enabling role in computational science and engineering (CSE), and as problems and data sets increase in size and complexity, this role continues to grow. To provide a forum for researchers interested in the interaction of combinatorial mathematics and algorithms with CSE, the SIAM Workshop on Combinatorial Scientific Computing (CSC09) will be organized in Monterey, CA, on October 29-31, 2009. The CSC09 workshop will follow and in part overlap with the 2009 SIAM Conference on Applied Linear Algebra.

CONFERENCES >



To RSVP to the conference on Facebook and connect with other attendees, find roommates etc., please go to the link below:

<http://www.facebook.com/event.php?eid=149926041727546#!/event.php?eid=184545531578681>.

The CSC11 workshop will be located with [SIAM Conference on Optimization \(OP11\)](#).





- ▶ At the ENS, Lyon, France
- ▶ Thanks to ANR's Milyon Center for Excellence for support.
- ▶ Cochairs: Bora Ucar, Paul Hovland
- ▶ <http://www.siam.org/meetings/csc14/>



- ▶ Albuquerque NM, Oct 10-12, 2016.
- ▶ Cochairs: Erik Boman, Assefaw Gebrmedhin
- ▶ The SIAM Proceedings on CSC was inaugurated! Eleven papers, edited by the Chairs and Bora Ucar.



- ▶ Bergen, Norway, June 6-8, 2018.
- ▶ General Chair: Frederik Manne. PC Chairs: Sivan Toledo, Peter Sanders
- ▶ The SIAM Proceedings on CSC had ten papers, edited by Aydin Buluc.



# CSC20



- Seattle, WA, Feb 2020, in the innocent days before Covid19!
- Co-Chairs: Sherry Li and Martin Buecker. Procs.  
Chair: Siva Rajamanickam
- Archival set of web pages for all CSC Workshops at [csc-research.org](http://csc-research.org), and also at SIAM Conference Archives.

# SIAM CSC Workshops:

## Thanks for the memories!

- All Chairs of the OC and PC
- All members of the OC and PC
- All past members of the Steering Committee
- Current members of the SC (2018-2020)
  - Rob Bisseling
  - Bruce Hendrickson
  - Sherry Li
  - Uwe Naumann
  - Bora Ucar