

# Preface

Digital and computational solutions are becoming the prevalent means for the generation, communication, processing, storage, and curation of mathematical information. Separate communities have been developed to investigate and build computer-based systems for computer algebra, automated deduction, and mathematical publishing as well as novel user interfaces. While all of these systems excel in their own right, their integration can lead to synergies offering significant added value. The Conference on Intelligent Computer Mathematics (CICM) offers a venue for discussing and developing solutions to the great challenges posed by the integration of these diverse areas.

CICM has been held annually as a joint meeting since 2008, co-locating related conferences and workshops to advance work in these subjects. Previous meetings have been held in Birmingham (UK 2008), Grand Bend (Canada 2009), Paris (France 2010), Bertinoro (Italy 2011), Bremen (Germany 2012), Bath (UK 2013), and Coimbra (Portugal 2014).

CICM 2015 was held in Washington, DC, during July 13–17, 2015, with four invited presentations, five main tracks, a number of workshops, a doctoral mentoring program, and an informal track to share work in progress. The program of the meeting, as well as additional materials, are available at <http://cicm-conference.org/2015/cicm.php>.

We were pleased to have four distinguished invited speakers to make presentations on a set of subjects, each touching on several CICM topics. This volume includes one abstract of a presentation by Leonardo de Moura (Microsoft Research) on “Formalizing Mathematics with The Lean Theorem Prover” and two full papers that were each written with co-authors by Tobias Nipkow (Technische Universität München) on “Mining the Archive of Formal Proofs” and Richard Zanibbi (Rochester Institute of Technology) on “Math Search for the Masses: Multimodal Search Interfaces and Appearance-Based Retrieval.” Furthermore, we had a talk by Jim Pitman (University of California, Berkeley) about GDML, the Global Digital Math Library project.

The abstract follows this preface, the two full papers are the first two in these proceedings.

As in previous years, we had several tracks, five altogether: Calculemus, Digital Mathematics Libraries (DML), and Mathematical Knowledge Management (MKM), which mirror the three main communities that form CICM, and two tracks on Systems and Data and Projects and Surveys.

The Calculemus track of CICM examines the integration of symbolic computation and mechanized reasoning, the Digital Mathematics Libraries track deals with math-aware technologies, standards, algorithms and processes, the Mathematical Knowledge Management track is concerned with all aspects of managing mathematical knowledge in informal, semi-formal, and formal settings.

The Systems and Projects track of previous years was split into two different tracks, first Systems and Data to explicitly stress the importance of data collections, and

second Projects and Surveys to also encourage survey papers, which may become a starting point for people interested in a particular subject.

Prior to the creation of CICM, two of the present tracks already had a significant history: there had been 15 previous Calculemus meetings and six MKM conferences. In 2007, when Calculemus and MKM were held together in Hagenberg, Austria, as part of the RISC Summer, it was decided to continue to hold these meetings together. This led to the first CICM in 2008. The DML track has been present since that first CICM, at first as a workshop. The other tracks were added in the form of a Systems and Projects track in 2011.

This year, CICM had 43 submissions. Of these, there were 27 full papers and 16 shorter descriptions (on systems, data, or projects). A small number of papers was moved between tracks when it was felt there would be a more natural fit. Each submission received at least three reviews, some four or even five. The review phase included a response period, in which authors could clarify points raised by the reviewers. This made for a highly productive round of deliberations before the final decisions were taken. In the end, the track Program Committees decided to accept 16 full papers (two of them surveys) and nine in Systems and Data or Projects for these proceedings.

The Program Committee work for the tracks was managed using the EasyChair system. This allowed committee members to declare actual or potential conflicts of interest, and thereby be excluded from any deliberations on those papers. Submissions on which track chairs had conflicts were handled by the general program chair. In this way, committee members could (and did) submit papers for consideration without compromising the peer-review process.

As in previous years, several workshops and informal programs were organized in conjunction with CICM 2015. This year these were:

- CICM Doctoral Program, providing a dedicated forum for PhD students to present their on-going or planned research and receive feedback, advice and suggestions from a dedicated research advisory board.
- CICM Work-in-Progress Session, a forum for the presentation of original work not yet in a suitable form for communication as a formal paper.
- ThEdu 2015 – Theorem Provers Components for Educational Software, with the goal of combining and focus systems from theorem proving, computer algebra, and dynamic geometry to enhance existing educational software and the design of the next generation of mechanized mathematics assistants. ThEdu was organized by Walther Neuper, Graz University of Technology, Austria, and Pedro Quaresma, University of Coimbra, Portugal.
- MathUI 2015 – 10th Workshop on Mathematical User Interfaces, an international workshop to discuss how users can be best supported when doing/learning/searching for/interacting with mathematics using a computer. MathUI was organized this year by Andrea Kohlhasse, University of Applied Sciences Neu-Ulm, and Paul Libbrecht, University of Education of Weingarten, Germany.

- Formal Mathematics for Mathematicians, a workshop dealing with developing large repositories of advanced mathematics. It was organized by Adam Grabowski, Artur Kornilowicz, University of Białystok, Poland, Krystyna Kuperberg, Auburn University, USA, Adam Naumowicz, University of Białystok, Poland, and Josef Urban, Radboud University, The Netherlands.

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