Preface

This volume contains the papers accepted for the Student Research Forum and for the Poster Section at the 42nd Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM 2016), which was held January 23–28, 2016, in Harrachov, Czech Republic.

SOFSEM (originally SOFtware SEMinar) is devoted to leading research and fosters cooperation among researchers and professionals from academia and industry in all areas of computer science. SOFSEM started in 1974 in the former Czechoslovakia as a local conference and winter school combination. The renowned invited speakers and the growing interest of the authors from abroad gradually turned SOFSEM in the mid-1990s into an international conference with proceedings published in the Springer LNCS series, in the last two years in their prestigious subline ARCOSS: *Advanced Research in Computing and Software Science.* SOFSEM became a well-established and fully international conference maintaining the best of its original winter school aspects, such as a higher number of invited talks and an in-depth coverage of novel research results in selected areas of computer science. SOFSEM 2016 was organized around the following three tracks:

– Foundations of Computer Science
  (chaired by Rūsiņš Mārtiņš Freivalds)
– Software Engineering: Methods, Tools, Applications
  (chaired by Gregor Engels)
– Data, Information, and Knowledge Engineering
  (chaired by Barbara Catania)

With its three tracks, SOFSEM 2016 covered the latest advances in research, both theoretical and applied, in selected areas of computer science. The SOFSEM 2016 Program Committee consisted of 61 international experts from 22 different countries, representing the track areas with outstanding expertise.

An integral part of SOFSEM 2016 was the traditional SOFSEM Student Research Forum (chaired by Roman Špánek), organized with the aim of presenting student projects in both the theory and practice of computer science, and to give the students feedback on the originality of their results. The papers presented at the Student Research Forum were published in separate local proceedings (together with the accepted posters). A copy of these local proceedings is available via CEUR-WS.

In response to the call for papers, SOFSEM 2016 received 150 abstracts and after withdrawals and removal of double and fake submissions, the final number of submitted papers totaled 116 from 38 different countries. The submissions were distributed in the conference three tracks as follows: 62 in the Foundations of Computer Science, 21 in the Software Engineering and 33 in the Data, Information, and Knowledge Engineering. From these, 34 submissions fell in the student category.

After a detailed reviewing process (using the EasyChair Conference System for rewieving and discussions), a careful selection procedure was carried out within each track. Following strict criteria of quality and originality, 43 papers were selected for presentation, namely: 27 in the Foundations of Computer Science, six in the Software Engineering and 10 in the Data, Information, and Knowledge Engineering.
Based on the recommendation of the chair of the Student Research Forum, 14 student papers were chosen for the SOFSEM 2016 Student Research Forum. Moreover, five posters were accepted for poster presentation.

As editors of these proceedings, we are grateful to everyone who contributed to the scientific program of the conference, especially the invited speakers and all the authors of contributed papers. We also thank the authors for their prompt responses to our editorial requests.

SOFSEM 2016 was the result of a considerable effort by many people. We would like to express our special thanks to:

- The members of the SOFSEM 2016 Program Committee and all external reviewers for their careful reviewing of the submissions
- The SOFSEM Steering Committee, chaired by Július Štuller, for guidance and support throughout the preparation of the conference
- The Organizing Committee, consisting of Martin Řimnáč (Chair) Pavel Tyl, Dana Kuželová, Július Štuller, and Milena Zeithamlová for the generous support and preparation of all aspects of the conference
- Springer for its continued support of the SOFSEM conferences
- CEUR-WS for publishing the copy of the second volume of the proceedings

We are greatly indebted to the Action M Agency, in particular Milena Zeithamlová, for the local arrangements of SOFSEM 2016. We thank the Institute of Computer Science of the Czech Academy of Sciences for its invaluable support of all aspects of SOFSEM 2016. Finally, we are very grateful for the financial support of the Czech Society for Cybernetics and Informatics.

December 2015   Barbara Catania
                                                            Gregor Engels
                                              Rūsiņš Mārtiņš Freivalds
                                                           Roman Špánek

Organization

Steering Committee

Barbara Catania	University of Genoa, Italy
Ivana Černá	Masaryk University, Brno, Czech Republic
Miroslaw Kutylowski	Wroclaw University of Technology, Poland
Jan van Leeuwen	Utrecht University, The Netherlands
Tiziana Margaria-Steffen	University of Limerick, Ireland
Brian Matthews	STFC Rutherford Appleton Laboratory, UK
Branislav Rovan	Comenius University, Bratislava, Slovakia
Petr Šaloun	Technical University of Ostrava, Czech Republic
Július Štuller, *Chair*	Institute of Computer Science, Academy of Sciences, Czech Republic

Program Committee

Track Chairs

Barbara Catania	University of Genoa, Italy
Gregor Engels	University of Paderborn, Germany
Rūsiņš Mārtiņš Freivalds	University of Latvia, Latvia

Student Research Forum Chair

Roman Špánek	Technical University of Liberec, Czech Republic

Program Committee Members

Farid Ablayev	Kazan, Russia
Marie-Pierre Béal	Paris, France
Steffen Becker	Chemnitz, Germany
Zohra Bellahsène	Montpellier, France
Petr Berka	Prague, Czech Republic
Mária Bieliková	Bratislava, Slovakia
Jan Bouda	Brno, Czech Republic
Stephane Bressan	Singapore, Republic of Singapore

Ruth Breu	Innsbruck, Austria
Tomáš Bureš	Prague, Czech Republic
Davide Buscaldi	Paris, France
Johann Eder	Klagenfurt, Austria
Uwe Egly	Vienna, Austria
Gregor Engels	Paderborn, Germany
Rusins Freivalds	Riga, Latvia
Johann Gamper	Bolzano, Italy
Giovanna Guerrini	Genoa, Italy
Theo Härder	Kaiserslautern, Germany
Hannu Jaakkola	Pori, Finland
Christos Kapoutsis	Carnegie Mellon, Qatar
Jarkko Kari	Turku, Finland
Efim Kinber	Sacred Heart University, USA
Reinhard Klette	Auckland, New Zealand
Georgia Koutrika	Palo Alto, USA
Stanislav Krajči	Košice, Slovakia
Andrzej Lingas	Lund, Sweden
Alexei Lisitsa	Liverpool, UK
Laura Mančinska	NUS, Singapore
Yannis Manolopoulos	Thessaloniki, Greece
Rainer Manthey	Bonn, Germany
Bruno Martin	Nice, France
Carlo Mereghetti	Milan, Italy
Paolo Missier	New Castle, UK
Pavol Návrat	Bratislava, Slovakia
Jerzy Nawrocki	Poznan, Poland
Martin Nečaský	Prague, Czech Republic
Boris Novikov	St. Petersburg, Russia
Alexander Okhotin	Turku, Finland
Claus Pahl	Dublin, Ireland
Evaggelia Pitoura	Ioannina, Greece
Kārlis Podnieks	Riga, Latvia
Jaroslav Pokorný	Prague, Czech Republic
Alexander Pretschner	Munich, Germany
Paolo Rosso	Valencia, Spain
Raymond Rudy	IBM Tokyo, Japan
Ismael Sanz	Castelló, Spain
Cem Say	Istanbul, Turkey
Ina Schäfer	Braunschweig, Germany
Alberto Marchetti Spaccamela	Rome, Italy
Romina Spalazzese	Malmö, Sweden
Athena Vakali	Thessaloniki, Greece
Madars Virza	MIT, USA
Andrzej Wąsowski	Copenhagen, Denmark
Jiří Wiedermann	Prague, Czech Republic

Abuzer Yakaryilmaz	Petropolis, Brazil
Tomoyuki Yamakami	Fukui, Japan
Thomas Zeugmann	Sapporo, Japan
Uwe Zdun	Vienna, Austria

Additional Reviewers

Mikhail Abramskiy	Filip Krijt
Ahmad Salim Al-Sibahi	Petr Kurka
Jesús Alonso	Giovanna Lavado
Marcella Anselmo	Dimitrios Letsios
Pablo Arrighi	Christos Levcopoulos
Hauke Baller	Jiamou Liu
Kaspars Balodis	Bruno Loff
Annalisa Barla	Anton Marchenko
Carl Barton	Arnaud Malapert
Luca Bernardinello	Ladislav Maršík
Krists Boitmanis	Lukas Märtin
Vincenzo Bonifaci	Vladimir Matena
Boban Celebic	Abel Molina
Kārlis Čerāns	Debajyoti Mondal
Aleksandar S. Dimovski	Viviane Moreira
Michael J. Dinneen	Michael Nieke
Mike Domaratzki	Bengt J. Nilsson
Mayte Giménez Fayos	Francesca Odone
Peter Floderus	Maris Ozols
Markus Frank	Peteris Paikens
Bulat Gabbasov	Mia Persson
Mohsen Ghaffari	Ved Prakash
Massimiliano Goldwurm	Julien Provillard
Alexander Golovnev	Renato Renner
Stefan Göller	David Roberson
Martin Haeusler	Lorenzo Rosasco
Florian Häser	Stefano Rovetta
Marcus Hilbrich	Clemens Sauerwein
Hendrik Jan Hoogeboom	Shinnosuke Seki
Jesper Jansson	Alexander Shen
Stacey Jeffery	Christian Sillaber
Zbynek Jiracek	Dzmitry Sledneu
Charles Jordan	Stefan Stanciulescu
Kamil Khadiev	Patrick Totzke
Alfred Khayroullin	Farouk Toumani
Dennis Komm	Leo Truksans
Christian Koncilia	Bianca Truthe

Robin Kothari	Alexander Vasiliev
Matthias Kowal	Marcos Villagra
Miroslaw Kowaluk	Shenggen Zheng
Sergejs Kozlovics	Mansur Ziatdinov
Maksims Kravcevs	Wieslaw Zielonka

Organization

SOFSEM 2016 was organized by the Institute of Computer Science of the Czech Academy of Sciences and Action M Agency, Prague.

Organizing Committee

Martin Řimnáč, *Chair*	Institute of Computer Science, Prague, Czech Republic
Pavel Tyl	Technical University Liberec, Czech Republic
Dana Kuželová	Institute of Computer Science, Prague, Czech Republic
Július Štuller	Institute of Computer Science, Prague, Czech Republic
Milena Zeithamlová	Action M Agency, Prague, Czech Republic

Supported by

ČSKI – Czech Society for Cybernetics and Informatics   **ČSKI**

SSCS – Slovak Society for Computer Science

Table of Contents