Message from the ICSA 2024 General Chairs and Program Chairs

Y. Raghu Reddy
International Institute of Information Technolgoy (IIIT)
Hyderabad, India
raghu.reddy@iiit.ac.in

Nenad Medvidović
University of Southern California
Los Angeles, CA, USA
neno@usc.edu

Romina Spalazzese
Malmö University
Maalmö, Sweden
romina.spalazzese@mau.se

Heiko Koziolek
ABB Corporate Research
Ladenburg, Germany
heiko.koziolek@de.abb.com

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I. Introduction

The IEEE International Conference on Software Architecture (ICSA) is the premier gathering of practitioners and researchers interested in software architecture, component-based software engineering, and quality aspects of complex software systems. The 21st IEEE International Conference on Software Architecture (ICSA 2024) continued the tradition of a working conference, where attendees met and where software architects were able to explain the challenges they face and try to influence the future of the field. Interactive working sessions were the place where researchers met practitioners to identify opportunities to shape the future of our field.

ICSA 2024 was held as an in-person conference at the International Institute of Information Technology Campus (IIIT-H) Hyderabad, India between 4th - 8th June 2024. Recent advances in capabilities and availability of generative artificial intelligence (AI) now allow users to generate text, source code, graphics, videos, and 3D models based on natural language descriptions. Software architects are already starting to use these tools to rationalize design decisions, to explore technology options, to synthesize source code based on patterns, and to generate architecture diagrams. The theme of ICSA 2024 was "Software Architecture in the Age of Generative AI". The conference welcomed contributions exploring the potentials and risks of this new technology for software architecture. We were particularly interested in soliciting papers describing novel tools, techniques, and methods to support software architects using generative AI. We were also looking for software and system architecture case studies that successfully or unsuccessfully applied this new technology.

Besides the main theme, we called on both researchers and practitioners for contributions that advance our understanding of architectures in real-world software, facilitate empirical research by making architectural artifacts and tools publicly available, and promote replicability of results through common datasets and benchmarks.

The history of ICSA—including its start as the Working International Conference on Software Architecture (WICSA) that integrated the CompArch conferences on Component Based Software Engineering (CBSE) and Quality of Software Architectures (QoSA) into what is now ICSA—is summarised on the History of ICSA web page (https://icsa-conferences.org/series/history/).

With a particular interest on what can be learned from our software architecture history, experiences, studies, and best practices, ICSA 2024 welcomed original papers that explore and explain the role of architecture in current and future systems. The variety of attracted contributions for the different tracs is summarized in the following section.

II. Types of submissions

Following the tradition of previous editions of the International Conference on Software Architecture, ICSA 2024 has been structured into a Research Track (whose papers are included in this volume of the proceedings), and additional tracks (whose contributions are included in the companion volume of the ICSA 2024 proceedings, together with the short papers from the Research Track).

A. Technical Track Statistics and Review Process

The Research Track of ICSA 2024 received a total of 66 abstract submissions and 59 full-paper submissions. Out of the full-paper submissions, 10 were desk rejected, 3 described research out of the scope of the conference and 7 submitted incomplete files. Consequently, 49 submissions were reviewed by the 66 members of the Program Committee, which had a gender ratio of 42.4% female members to 57.6% male members, and included 9,1% early-career researchers and 7,6% members from industry.

Each of these 49 submissions underwent a rigorous review process carried out by at least three PC members, and including detailed Program Committee discussions. Out of all submissions, 17 papers have been accepted, resulting in an acceptance rate of 34,7%. These papers are included in this volume of the proceedings.

Six additional submissions were accepted as short papers, given their strong potential for developing the area of software architecture. The six papers are published in the ICSA 2024 companion proceedings.

B. Other Tracks and Review Process

In addition to the Research Track, ICSA 2024 sought submissions for Workshops and the following seven were accepted, providing a nice and varied addition to the program:

- WASA 2024: 10th International Workshop on Automotive System/Software Architectures
- GREENS 2024: 8th International Workshop on Green and Sustainable Software
- FAACS 2024: 8th International Workshop on Formal Approaches for Advanced Computing Systems
- SAML 2024: 3rd International Workshop on Software Architecture and Machine Learning
- TwinArch & DTE 2024: 3rd International Workshop on Digital Twin Architecture (TwinArch) and Digital Twin Engineering (DTE)
- QUALIFIER 2024: 2nd International Workshop on Quality in Software Architecture
- EDGE SOFTWARE ARCHITECTURE 2024: 1st Workshop on Edge Software Architecture

ICSA 2024 also sought submissions for Artifact Evaluation Track (badges are integrated on the papers in the ICSA 2024 proceedings), Journal First Track, as well as for the following tracks:

- Software Architecture in Practice (SAIP) Track
- Early Career Researchers Forum Track
- New and Emerging Ideas (NEMI) Track
- Posters Track
- Tutorials and Technical Briefings Track

The Software Architecture in Practice (SAIP) Track is a forum that provides researchers and practitioners a platform to discuss insights, innovations, solutions, and experiences related to the application of software architecture to real-world software engineering problems. The SAIP Track attracted 21 submissions of which 9 were accepted for presentation at the conference, after a thorough review process.

The goal of the Early Career Researchers Forum (ECRF) Track was to inspire and bring together early career researchers in the field of software architecture. The forum provided a vibrant place for discussing potential and ongoing research in any stage, from ideas to results. The forum accepted a paper and strived to provide a friendly environment for early career researchers to get feedback on their work, exchange experiences, ask questions, and explore available research pathways.

The goal of the New and Emerging Ideas (NEMI) Track at ICSA was to encourage the software architecture community to propose new software architecture research visions and ideas, which can potentially challenge the status quo of the software architecture discipline, research and practice, and point to new directions and opportunities. After a thorough review process, the NEMI Track accepted 10 submissions as papers at the conference, out of the 21 attracted submissions.

The Posters Track provided an opportunity for both practitioners and researchers to present and discuss the most recent advances, ideas, experiences, and challenges in the field of Software Architecture by means of poster presentations. Reflections on the past, descriptions of current initiatives, visions of the future, and new results in Software Architecture research and practice were particularly welcome. The track stimulated discussions among conference participants through a face-to-face poster session including the 6 posters that were accepted after a careful selection out of the 10 submitted ones.

Finally, ICSA 2024 hosted 4 tutorials through the Tutorials and Technical Briefings Track that supported advancing the software architecture knowledge and enriching the overall conference experience:

- Architecting for Sustainability with the SAF Toolkit
- Data Mesh Architecture: From Theory to Practice
- Distributed Systems - What Every Software Architect Should Know
- LLMs for code: The potential, prospects, and problems

C. Awards

Following the tradition of previous editions, ICSA 2024 gave awards to exceptional authors and reviewers. These authors and reviewers have been selected based on a thorough selection process.

The Distinguished Paper Award, Best Reviewer Award, Best Poster Award, and Most Influential Paper Award were presented.

The Most Influential Paper Award referred to WICSA, CBSE and QoSA from 2014. The selection process was led by Uwe Zdun (University of Vienna, Austria) and Philippe Kruchten (University of British Columbia, Canada), the Most Influential Paper Award Chairs of ICSA 2024. The selection process included the chairs identifying a short list of papers, soliciting input from the Program Committee and the chairs analyzing the nominations and, based on the collected input, making a final decision. Both the best poster and most influential paper award recipients were invited to give a presentation during the days of ICSA 2024 main program.

All awards were presented during the Awards Ceremony of the conference.

III. CONFERENCE PROGRAM

The contributions from all the tracks were organized as a blended program to promote collaboration across all software architects independently from the career stage there are in, or whether they are software architect practitioners or researchers. 8th June was designated as industry day and the participants had an opportunity to interact with the local IT Industry over networking lunch and Hi-Tea. Twelve presentation sessions and three keynote sessions were included across the three days of the ICSA 2024 main program.

ICSA 2024 also invited three keynotes from strong international leaders who gave talks in highly relevant areas to software architecture practice:

- Paola Inverardi, Rector of Gran Sasso Science Insitute (GSSI), L'Aquila, Italy, discussed important concerns involved when designing system that act ethically when interacting with, or on behalf of, humans.
- Ipek Ozkoya, Technical Director, Software Engineering Institute, Carnegie Mellon University, USA, encouraged software architects to reconsider assumptions, roles and responsibilities in relation to the architecting process when generative AI-based tools are involved.

- Bharat Raizada, Managing Director and Chief Technology Officer, Wells Fargo, India & Philippines provided an interesting industrial perspective about the digital transformation we started experiencing including additional facets to the technological one.

The workshops and tutorials were presented during the first two days of the ICSA 2024 week.

IV. Concluding Remarks

The General Chairs and Program Chairs want to thank all members of the ICSA 2024 Organizing Committee, for their hard work and commitment that made the conference possible. We want also to express our special thanks to the Program Committee members, who dedicated significant time and effort not only to reviewing submitted papers but also to very actively participating in Program Committee discussions.

We want also to thank all the authors who submitted their research to ICSA 2024, both authors of accepted papers and those of papers that were not accepted for presentation at the conference. We hope that the received reviews provided thorough and useful feedback for future improvements of your work. We are grateful to all our sponsors including ABB India and IBM (bronze sponsors), Componentology and SEI/CMU (silver sponsors) and our conference partner and sponsor organization, the IEEE Computer Society. We also extend our appreciation to supporters SERC, Software Engineering Research Center, IIIT Hyderabad, and IEEE TCSE.

Last but not least, we would like to thank all the attendees who contributed to the vibrant discussions to keep advancing knowledge and practice of software architecture.

Y. Raghu Reddy and Nenad Medvidović, **General Chairs**

Romina Spalazzese and Heiko Koziolek, **Program Chair**