

# Preface

The increasing complexity of software and hardware systems and their ever more central role in society poses many challenges concerning their reliability, safety, correctness, and robustness. Based on a variety of fundamental concepts from theoretical computer science, formal methods techniques aim at making a significant contribution to better quality systems. The development and use of formal methods aspire to mathematically sound methods and tools for system analysis and verification.

This volume contains the selected and revised papers of the 9th IPM International Conference on Fundamentals of Software Engineering (FSEN 2021). Due to the continuing effects of the COVID-19 pandemic, this event was held as a virtual event and run from Tehran, Iran, during May 19–21, 2021. This biennial event is organized by the School of Computer Science at the Institute for Research in Fundamental Sciences (IPM) in Iran in cooperation with ACM SIGSOFT and IFIP Working Group 2.2. The topics of interest in FSEN span over all aspects of formal methods, especially those related to advancing the application of formal methods in the software industry and promoting their integration with practical engineering techniques.

The Program Committee of FSEN 2021 consisted of 42 top researchers from 16 countries. This edition of FSEN received 38 submissions from 18 countries. Each submission was reviewed by at least three independent referees, for its quality, originality, contribution, clarity of presentation, and its relevance to the conference topics. After thorough discussions on each individual paper, the Programme Committee has accepted 12 regular full papers and 4 short papers for inclusion in the present proceedings.

Many people contributed to make FSEN 2021 a success. We would like to thank the two distinguished keynote speakers that gave their excellent and stimulating presentations at FSEN 2021: Marta Kwiatkowska and Mira Mezini. We also would like to thank the many authors that submitted high-quality papers. Special thanks also go to the Institute for Research in Fundamental Sciences (IPM) in Tehran, Iran, for their financial support and to the local organization team of FSEN 2021 that ran this virtual edition of the conference in an excellent way, including the exceptional virtual guided tours through some of the most magnificent places of Iran. Many thanks also go to: the General Chairs Farhad Arbab and Pejman Lotfi-Kamran and the Steering Committee of FSEN, especially its Chair Marjan Sirjani, for their valuable support and feedback during all phases of the organization; the members of the Program Committee for their time, effort, and excellent and timely contributions to ensure that FSEN remains a high-quality international conference; and to the Publicity Chair Maurice ter Beek for his excellent job in advertising the conference. We are also grateful to IFIP, the IFIP Working Group 2.2, and ACM for their continuing support of the FSEN conference series. Furthermore, we thank the providers of the EasyChair conference management system, whose tool greatly helped us run the review process and facilitate the preparation of these proceedings. Finally, we are indebted to all conference attendees for

their active and lively participation in the FSEN research community, ultimately contributing to the success of this special conference series.

August 2021

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