# PREFACE

This special issue contains extended versions of papers presented at FSCD 2022, the 7th International Conference on Formal Structures for Computation and Deduction. FSCD 2022 was held from August 2–5 in Haifa, Israel, as part of the Federated Logic Conference (FLoC).

FSCD (`https://fscd-conference.org/`) covers all aspects of formal structures for computation and deduction from theoretical foundations to applications. Building on two communities, RTA (Rewriting Techniques and Applications) and TLCA (Typed Lambda Calculi and Applications), FSCD embraces their core topics and broadens their scope to closely related areas in logic, models of computation, semantics, and verification in new challenging areas.

The papers selected for this special issue underwent a reviewing process in two stages. In the first stage, the FSCD program committee selected 31 papers out of 59 submissions. From the papers presented at the conference, we invited authors of selected papers to submit revised and extended versions of their work to this special issue.

In the second stage, the submitted extended papers were reviewed following the usual high standards of LMCS, and six were accepted. The topics of the papers include category theory, logic, quantum computation, rewriting, semantics and type theory. The papers thus reflect upon traditional and recent hot topics of FSCD. In the following, we give a brief description of each of the accepted papers.

*A Fibrational Tale of Operational Logical Relations: Pure, Effectful and Differential* by Francesco Dagnino and Francesco Gavazzo. This work provides foundational understanding of operational logical relations and contains two contributions: first the authors give a general categorical framework of logical relations for (call-by-value) operational semantics. As the second (and main) contribution, the authors give a categorical generalization/understanding of a recent relational-lifting technique called differential logical relations.

*Addition and Differentiation of ZX-Diagrams* by Emmanuel Jeandel, Simon Perdrix and Margarita Veshchezerova. The ZX-calculus is a powerful framework for reasoning in quantum computing. The paper establishes a way to represent the sum of two ZX-diagrams as another ZX-diagram, based on which the authors continue to establish a representation theorem for differentiation. This establishes solutions to problems that had been considered in the ZX-calculus community for a couple of years already.

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All articles have already been published in the regular issues of Logical Methods in Computer Science.

*An Analysis of Tennenbaum's Theorem in Constructive Type Theory* by Marc Hermes and Dominik Kirst. Four variants of Tennenbaum's theorem are given (including one under an anti-classical axiom which rules out any non-standard model). They are all already known from the literature and the contribution is to formalize them in full detail, formally analyzing the logical assumptions they rely on. The conference version was awarded the FSCD 2022 Best Paper Award by Junior Researchers.

*Compositional Confluence Criteria* by Kiraku Shintani and Nao Hirokawa. The authors show how confluence criteria based on decreasing diagrams are generalized to ones composable with other criteria. For demonstration of the method, the confluence criteria of orthogonality, rule labeling, and critical pair systems for term rewriting are recast into composable forms.

*Galois Connecting Call-By-Value and Call-By-Name* by Dylan McDermott and Alan Mycroft. The paper establishes a general framework for reasoning about the relationship between call-by-value and call-by-name. In languages with computational effects, call-by-value and call-by-name executions of programs often have different, but related, observable behaviours. This nice and elegant contribution crystallizes an intuition that seems to be fairly well established in existing results.

*Stabilized Profunctors and Stable Species of Structures* by Marcelo Fiore, Zeinab Galal and Hugo Paquet . The paper generalizes the notion of polynomial functor so that the 2-category of generalized polynomial functors becomes a cartesian closed bicategory. This serves as a model of simply typed lambda calculus, and will lead to further research towards a model of linear logic and differential lambda calculus.

Foremost, we would like to thank all the authors for their professional work to prepare submissions, and the reviewers for their very constructive and helpful suggestions to improve the original submissions. Further, we would like to thank Herman Geuvers as chair of the Steering Committee of FSCD, as well as Brigitte Pientka, as Executive Editor of LMCS. Their advice has been invaluable. Finally, we would like to thank the layout editors at LMCS, handling the final steps of the publication process.

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Amy Felty and Georg Moser
Guest Editors of the FSCD 2022 Special Issue

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