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Quantitative Evaluation of Systems

18th International Conference, QEST 2021
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Proceedings

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Preface

It gives us great pleasure to open these proceedings of the 18th International Conference on Quantitative Evaluation of SysTems. QEST 2021 was hosted within QONFEST 2021, and held virtually during August 23–27, 2021. The event was co-located with CONCUR, FORMATS, FMICS, and other workshops.

The QEST conference series has a long and rich history, as can be seen at <https://www.qest.org>. Most recently, it was held in Vienna (Austria, in virtual mode), Glasgow (UK), Beijing (China), Berlin (Germany), and Quebec City (Canada). Further information on QEST 2021 can be found on the conference webpage at <https://www.qest.org/qest2021/>.

The 34 members of the International Program Committee (PC) helped to provide at least three reviews for each of the 47 submitted contributions. Based on the reviews and PC discussions, 23 high-quality papers - two of them as short contributions and two of them as tool papers - were accepted to be presented during the conference. The overall acceptance rate for the conference was thus just below 50%. The contributions were bundled into eight thematic sessions, covering the following topics in verification and evaluation: Probabilistic Model Checking, Learning and Verification, Abstractions and Aggregations, Stochastic Models, Quantitative Models and Metamodels, Queueing Systems, Simulation, and Performance Evaluation. These contributions appear as papers in the ensuing proceedings.

The program chairs plan to edit a special issue of the journal ACM TOMACS, where the authors of selected papers will be invited to contribute significantly revised and extended versions of their manuscripts containing new results.

QEST 2021 did not host a poster session (as is common for the conferences in the series) due to difficulty of interaction and limited time in the virtual format, but Best Paper awards were presented, according to QEST policies and tradition.

A highlight of QEST 2021 was the presence of two high-profile invited speakers, amongst those of QONFEST:

- Boudewijn Haverkort from Tilburg University the Netherlands, giving a lecture on the topic of “Performance Evaluation: Model or Problem Driven?”.
- François Baccelli from Inria, France, and the University of Texas at Austin, USA, contributing with a seminar on the topic of “Stochastic Geometry based Performance Analysis of Wireless Networks”.

Short contributions on the topics of the two keynotes appear in these proceedings.

Another highlight of QEST 2021 was the introduction of an optional Repeatability Artifact Evaluation process for accepted papers, providing to authors feedback on their shared codebase associated to the submitted article. This initiative was much in line with similar ones at cognate verification conferences, and was aimed at increasing the open sharing of reproducible scientific software-generated results. A total of 14 papers participated in the repeatability evaluation (this was obligatory for tool papers), 12 of

which were finally found to be repeatable (up to different degrees of completeness). A special badge marks them in the ensuing proceedings. The repeatability evaluation committee was co-chaired by Arnd Hartmanns and David Safranek.

A few words of acknowledgment are due. First and foremost, thanks to the authors for entrusting their best work to QEST 2021. The review process clearly showed that the conference was able to put the bar for acceptance really high, which makes us very proud. Our thanks go to the QEST steering committee and previous conference chairs for their help and feedback on the organization process. We were also particularly pleased with the interest in the repeatability evaluation, and thank the repeatability evaluation committee and chairs (Arnd Hartmanns and David Safranek) for the truly exemplar work, and all the authors who participated in this exercise, which was novel for QEST. Sincere thanks to the local organizing committee (in particular, Benoit Barbot for the administration of QONFEST), to the steering committee of the QEST conference series (in particular its chair, Enrico Vicario), and to Marco Paolieri for the conference website and for the event publicity.

Finally, we wish to thank all the PC members and additional reviewers for their hard work in ensuring the quality of the contributions to QEST 2021, and to all the participants for contributing to this memorable event.

August 2021

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Stochastic Geometry Based Performance Analysis of Wireless Networks (Abstract of Keynote)

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Extended Abstract

Stochastic Geometry is commonly used for analyzing spectrum sharing in large wireless networks. In this approach, network elements, such as users and base stations, are represented as point processes in the Euclidean plane, and interference fields as spatial shot-noise processes. The analytical machinery of stochastic geometry and basic formulas of information theory can then be combined to predict important spatial statistics of such networks.

The talk will first exemplify this approach by showing how to derive the distribution of the Shannon rates obtained by users in two fundamental models, the Poisson dipole model, which is a mathematical abstraction for a large device to device network, and the Poisson-Voronoi model which is an abstraction for a large cellular network. A few variants of these now classical models will be also discussed, like multi-tier cellular networks, or networks leveraging beam-forming.

The talk will then exemplify how to introduce birth-and-death type dynamics in this stochastic geometry framework. This will be illustrated through recent results on the simplest model in this class. In this model, users arrive according to a Poisson rain process on the Euclidean plane and leave with a stochastic intensity proportional to their instantaneous Shannon rate.

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