Report on ICALP 2011

38*th* International Colloquium on Automata, Languages and Programming
4-8 July 2011, Zürich, Switzerland

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ICALP 2011, the 38th conference of this series in Theoretical Science, took place at Z¨ from July 4 to 8, together with 4 workshops from July 4 to 8.

Conference site was E ¨ T H Z¨ (ETHZ), in buildings ML (plenary sessions) and CAB (parallel tracks), about 100 m apart from each other, and 10 min walk from the town centre.It was organized by I - ¨ T I , D I , ETHZ.

The organizing committee consisted of M H , J H ˇ, U M , A S , E W , and P W , together with M B , Y B , T C , Y D , A E F - , H F , A F , H G , T H , T ´ˇ H ´ , M J , R K ´ ˇ, C K , C L , J H M , M ˇ M ´ , R M , T M¨ , G N - , U P , A S , D S , M S , R - Š ´ , M S , S S , B ¨ T , H T - , and A K Z .

ICALP 2011 was supported by EATCS, ETHZ, FNSNF (F N S - , S N), and G .

The conference was attended by 290 participants (52 attending only the workshops) from 30 countries, as shown in the following table:

CH	47	IT	22	PL	6	BE	3	KR	2	BR	1
DE	41	IL	16	ES	5	SE	3	LV	2	CL	1
US	34	NL	11	CZ	4	AT	2	NO	2	CN	1
FR	28	CA	10	DK	4	HK	2	SG	2	FI	1
UK	25	JP	7	GR	4	IS	2	AU	1	SK	1

The scientific program consisted of 5 invited, 2 special lectures, and 114 contributions, selected from 398 submissions (5 were withdrawn) from 38 countries. Apart from the invited and special talks, and the 3 best paper and 3 best student papers, the presentations took place in 28 sessions (17 in track A, 7 in B, 4 in C), normally 3 in parallel, once 4 in parallel.

The distribution by countries is given below where C=country, I=invited, AS= track A submitted, AA=track A accepted, ΣSsum of submitted, ΣA=sum of accepted, W=withdrawn.

C	I	AS	AA	BS	BA	CS	CA	ΣS	ΣA
AR				$\frac{5}{8}$				$\frac{5}{8}$	
AT		1		$\frac{1}{2}$		$\frac{1}{2}$		2	
AU		$2\frac{3}{4}$	$\frac{1}{4}$			$\frac{1}{3}$	$\frac{1}{3}$	$3\frac{1}{12}$	$\frac{7}{12}$
BE		$1\frac{3}{4}$	$\frac{1}{3}$	$1\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$4\frac{3}{4}$	$1\frac{7}{12}$
BR		1		2				3	
CA		$10\frac{13}{20}$	$5\frac{5}{12}$	$3\frac{1}{3}$	$1\frac{1}{3}$	$1\frac{5}{6}$	$\frac{1}{4}$	$15\frac{49}{60}$	7
CH		4	$3\frac{1}{4}$			$1\frac{1}{3}$	$\frac{1}{3}$	$5\frac{1}{3}$	$3\frac{7}{12}$
CL				$\frac{1}{3}$		1	1	$1\frac{1}{3}$	1
CN		$4\frac{3}{20}$	$\frac{1}{3}$	$4\frac{1}{2}$	$\frac{1}{2}$	1		$9\frac{13}{20}$	$\frac{5}{6}$
CZ		$2\frac{1}{2}$	$\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{1}{4}$			$5\frac{1}{4}$	$1\frac{3}{4}$
DE		$35\frac{37}{60}$	$8\frac{47}{60}$	$10\frac{47}{60}$	$3\frac{2}{3}$	9	$5\frac{11}{12}$	$55\frac{2}{5}$	18
DK	1	$1\frac{1}{3}$	1	$4\frac{19}{30}$	$1\frac{11}{30}$			$5\frac{29}{30}$	$2\frac{11}{30}$
ES		$\frac{1}{3}$		$4\frac{5}{6}$	$\frac{5}{6}$	$\frac{13}{20}$		$5\frac{49}{60}$	$\frac{5}{6}$
FI		1						1	
FR	1	$9\frac{3}{4}$	$2\frac{5}{12}$	$22\frac{109}{120}$	7	$4\frac{1}{3}$	$\frac{1}{3}$	$36\frac{119}{120}$	$9\frac{3}{4}$
GR		$5\frac{5}{6}$	$\frac{1}{3}$			$1\frac{1}{12}$		$6\frac{11}{12}$	$\frac{1}{3}$
HK		$2\frac{4}{5}$	$1\frac{4}{5}$			$2\frac{5}{6}$	1	$5\frac{19}{30}$	$2\frac{4}{5}$
HU		$\frac{3}{4}$	$\frac{1}{2}$			$\frac{1}{3}$		$1\frac{1}{12}$	$\frac{1}{2}$
IE				$1\frac{1}{2}$	$\frac{1}{2}$			$1\frac{1}{2}$	$\frac{1}{2}$
IL	1	$23\frac{2}{3}$	$3\frac{11}{30}$			$6\frac{3}{4}$	$1\frac{3}{4}$	$30\frac{5}{12}$	$5\frac{7}{60}$
IN		$5\frac{13}{30}$	$1\frac{2}{3}$	3		1		$9\frac{13}{30}$	$1\frac{2}{3}$
IR		1						1	
IS						1	1	1	1
IT		$2\frac{5}{6}$	$\frac{5}{6}$	$10\frac{1}{6}$	1	$1\frac{41}{60}$		$14\frac{41}{60}$	$1\frac{5}{6}$
JP		$10\frac{3}{4}$	$1\frac{1}{2}$	2	2	$\frac{7}{12}$		$13\frac{1}{3}$	$3\frac{1}{2}$
MX		1						1	
NL		$4\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{11}{12}$	$\frac{7}{12}$	$\frac{1}{4}$		$7\frac{2}{3}$	$2\frac{5}{6}$
NO		$1\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{3}$				$1\frac{7}{12}$	$\frac{3}{4}$
PL		$4\frac{1}{4}$	$1\frac{1}{4}$	$2\frac{1}{2}$	$\frac{1}{3}$			$6\frac{3}{4}$	$1\frac{7}{12}$
RO		$\frac{1}{3}$						$\frac{1}{3}$	
RU		2			$\frac{1}{2}$			$2\frac{1}{2}$	
SE		$2\frac{11}{12}$	$\frac{3}{4}$	$\frac{1}{2}$				$3\frac{5}{12}$	$\frac{3}{4}$
SG		$2\frac{3}{4}$	$\frac{1}{3}$			$\frac{1}{3}$		$3\frac{1}{12}$	$\frac{1}{3}$
SK		$\frac{1}{4}$	$\frac{1}{4}$					$\frac{1}{4}$	$\frac{1}{4}$
TR		2						2	
TW		2						2	
UK		$18\frac{1}{3}$	8	$14\frac{43}{60}$	$6\frac{43}{60}$	$3\frac{7}{12}$	$\frac{1}{2}$	$36\frac{19}{30}$	$15\frac{13}{60}$
US	2	$70\frac{31}{60}$	$22\frac{2}{15}$	$6\frac{1}{6}$	$1\frac{1}{6}$	$10\frac{1}{12}$	$4\frac{1}{12}$	$86\frac{23}{30}$	$27\frac{23}{60}$
	5	241	68	103	29	50	17	394	114
W		3				2		4	

The distribution by number of authors was as follows (NA=number of authors):

NA	AS	AA	BS	BA	CS	CA	ΣS	ΣA
1	46	8	27	5	4	3	77	16
2	96	29	39	9	16	7	151	45
3	60	16	20	8	16	4	96	28
4	23	8	11	5	9	2	43	15
5	10	4	4	1	3		17	5
6	6	3	2	1	1		9	4
15					1	1	1	1
	241	68	103	29	50	17	394	114

ICALP 2011 covered the following fields (session titles):

A1 Network Design Problems	A15 Matchings and Sorting
A2 Quantum Computing	A16 Constraint Satisfaction
A3 Graph Algorithms	Algebraic Complexity
A4 Games, Approximation Schemes,	A17 Steiner Problems, Clustering
Smoothed Analysis	
A5 Online Algorithms	B1 Foundations of Program Semantics
A6 Data Structures,	B2 Automata and Formal Languages
Distributed Computing	B3 Model Checking
A7 Complexity, Randomness	B4 Probabilistic Systems
A8 Submodular Optimization,	B5 Logic in Computer Science
Matroids	B6 Hybrid Systems
A9 Cryptography, Learning	B7 Specification and Verification
A10 Fixed Parameter Tractability	
A11 Hardness of Approximation	C1 Graphs
A12 Counting, Testing	C2 Matchings and Equilibria
A13 Complexity	C3 Privacy and Content Search
A14 Proof Complexity	C4 Distributed Computation

The following 4 satellite workshops, all taking place on July 3 in building CAB, were attended by about 80 participants altogether.

G   A   A   (GA) Organizer: C   D   .
This workshop took place in honour of the 70th birthday of G   A   .
G   (GT) Organizers: F   C   , E P .
D   C   M   (DCM 2011)
Organizers: E   K , J K , F   R   .
S   D   K   (SDKB)

Organizers: K   -D   S   , B   T   .

with number of talks given below (I invited, S submitted):

	I	S
GA	2	14
GT	2	9
DCM	3	8
SDKB		9

ICALP 2011 was opened on Monday morning by E   W   starting with his first ICALP at A   30 years ago, also showing the badge of that conference. When being young, his mother had forced him to buy some formal dress (jacket, tie, solid shoes). But when arriving at the conference hotel he saw J   R   sitting there in a summer outfit, the feet in sandals propped on a chair, without tie, writing the transparencies. He immediately took off his jacket and tie.

Someone from the ICALP 2011 audience then asked him *'Why aren't you taking off your jacket now?'*.

M   H   then gave some organizational informations on receptions, lunch, and some suggestions for the free Wednesday afternoon such as swimming in L   (F   for women only, L   , S   ), boat trip on Z̈   lake, hiking on U   and G   M   , or town sightseeing.

The first invited lecture *'Welfare and Revenue in Ad Auction'* by É   T   (co-authors B   L   , R   P   L   ) was a very good and interesting overview on selfish behaviour and social welfare. She started with a picture of a cow (some cow sculptures can be found in Zürich), and talked about routing games, games with good price of anarchy, today auction games, truthful auctions, today ad auctions, keyword auctions, maximizing welfare, generalized second price (GSP), Nash equilibrium, measurement of (in)efficiency, envy-free equilibria, uncertainty games,

Bayesian games, uncertainty about ad quality, and finished with some welfare results as a bound of anarchy price (with a *'flavour of a proof because of a theory conference'*) and some open problems as *'What is selfish outcome?'*.

R   A   (co-author P   Č   ´) presented a good second invited talk with *'Streaming String Transducers'*, in a survey on verification, model checking, concurrent data structures, string transducers ((non)deterministic 2-way, regular), streaming string transducers, related decision and closure properties, and expressiveness. After half an hour the laptop shut down and started updating, commented by him with *'Microsoft has some interesting products'*. 5 minutes later he could continue in a normal way.

The third invited talk, *'An Introduction to Randomness Extractors'* by R
S   was a very good and well illustrated survey on random extractors being
important in numerous fields (complexity theory, cryptography, combinatorics,
coding).

He started with *'Daddy, how do computers get random bits?'*, continuing with
deterministic extractors (von Neumann, Santha-Vazirani), multiple sources ex-
tractors (measuring entropy of source distribution, flat distributions, formal defi-
tion of multiple source distribution, explicit 2-source extractors, relations to Ram-
sey graphs), and seeded sources extractors (silation of randomized algorithms,
tools for explicit constructions, graphs with volume expansion, extractor and ex-
pander graphs), and finishing with *'Daddy, can you tell me that story again?'*.

With the fourth invited lecture *'Invitation to Algorithmic Uses of Inclusion-
Exclusion'* T   H   offered an excellent survey on the algorithmic use of
the principle of inclusion-exclusion, well illustrated, with applications in vertex
colouring, counting number of independent sets, inclusion-exclusion for sets, per-
fect matchings in pipartite and general graphs, Hamiltonian paths, k-paths, Steiner
trees, Yate's algorithm, and Möbius inversion. At the beginning he noticed *'Four
people in the audience know everything'* (one had already left), and finished with
a picture of Möbius.

The fifth invited talk, *'On the Relation between Differential Privacy and Quan-
titative Information Flow'* by   P   (co-authors M´   S. A   ,
M   E. A   ´, K   C   ), starting with *'ICALP 2011
started with a female invited lecture and ends with such'*, was a very good talk on
secure information flow (almost always a leak), information-theoretic framework
of it, quantification of leakage, models of adversaries, randomization for hiding
secrets, strong anonymity, secret and public information, relation to information
theory (a priori and posteriori uncertainty, Shannon entropy and capacity, Rényi
min-ebtropy), differential privacy and utility.

A highlight of the conference was the award ceremony on Thursday afternoon.
First B   A   T   (* February 19, 1921) received the
EATCS award, the laudatio being read by P   S   (details can be found in
EATCS Bulletin 104). He then gave a talk *'Recollections and Reflections'*. R¯¸´
F   who wrote his PhD 40 years ago in N   under B. T.' guidance,
presented flowers and was assisting him, It was a long presentation with many
facts of his scientific life: remembering ICALP 2001 at H   with a talk
'Automata, Circuits and Hybrids: facts of Continuous Time', ICALP 2011 back
to beginning of his research in logic, under C   's umbrella (K´   ´ , B¨   ,
E   , A. M   ), founding fathers of TCS (creators of core concepts, Church-
Turing thesis, K   , S   ), other two Church theses (functional programming,
Landin, pseudo-randomness, Mieses Kolmogorov), more on Church's heritage in

TCS (Church, automata and beyond, von Neumann), impact of descriptive set theory (B.T. existence of disjoint sets not separable by recursive sets), logic and computability (LC 1) (impossibility of algorithms for decision problems on finite domains, B.T., Kálmár, Kolmogorov, Uspensky), LC 2 (E. Post, A. Muchnik, R. Friedberg, super problem, B.T. complexity measure, signalizing function), logic and automata (LA 1) (conceptual preferences, transducers, Burks, Wright versus acceptors, Kleene, 3 level paradigm of fundamental formalisms, declarative, executive, interactive), LA 2 (Church survey 1972, B.T. language of second order t-formulas, Büchi, Elgot, weak second order arithmetic), LA 3 (Church synthesis problem for full MSO), formalization of concepts in terms of computations and complexity (lack of oracle power and autoreduction).

In the second part he mentioned some problems he had faced in the communist era, as the dangerous *'Penza affair* (1951-1953, tutorial monograph on algorithms and computing machines), his affiliation with *Institute of Mathematical Machines* (1956-1960) and the chief designer *Bashir Iskanderovich Rameev*, the *'Perebor affair* with academic disputes with *S. Yablonski* (discrete analysis versus introduction of predicate logic into automata research), suppression (Yablonski brooked any rival as arbiter of TCS), and facing obstacles in 1968 (99-letter, A. Esenin-Volpin, alternative conferences, Ershov's library, contacts and collaboration with A. Meyer). Finally he thanked all colleagues of the TCS community, and finished with *'For me best computing are Turing machine'*, followed by long ovations of the audience.

P   B   -D   received the P   award for timed automata, timed logics, and temporal logics. A   T   read the laudatio (details in EATCS Bulletin 104). After that the honoured presented a well illustrated talk *'A Small Story on Timed Automata'*, on model checking, its modelization, travels to conferences in 2010 (Stockholm, Copenhaguen, Hamburg, Paris) as example, timed automata, timed games, stochastic models, unexpected events (as eruption of *Eyjafjatlayökutl* eruption), other quantitative information (money etc.), and weighted automata, finishing with *'What to do with such models?'* and thanking all collaborators and colleagues, and EATCS.

Except for that of R   H   and J   H   all contributions were presented.

On Monday afternoon the best student papers with A: *'A 1.488-Approximation Algorithm for the Uncapacitated Facility Location Problem'* by S   L , B: *'Rice's Theorem for mu-Limit Sets of Cellular Automata* by M   D   '*, C: *'Fault-Tolerant Compact Routing Schemes for General Graphs'* by S   C   , with nice illustrations, and on Tuesday afternoon the best papers with A: *'Local Matching Dynamics in Social Networks'* by M   H   , illustrated with examples as *'Frank wants to go to soccer match'*, room-mate, marriage (*'I never forget a

face'), B: *'Regular Languages of Words over Countable Linear Orderings'* by O   C   (co-authors T   C   , G   P   ), C: *'Algebraic Independence and Blackbox Identity Testing'* by J   M   -   (co-authors M   B   , N   S   ), were presented by their authors in excellent talks.

Only some personal impressions from the other contributions can be mentioned here. Very good and interesting presentations were given by A   M   -   on limits to reduce quantum dimensionality, by M   L   on isomorphisms of regular trees and words, by G   Z   on nice results on the power of grammars,automata, and transducers, controlled by monoids, and by L   F   on computational power of random strings.

Other very good talks were given by D   N. J   on CSL and CTMC model checking based on automata, well illustrated with games, starting with a plan to arrive at Zürich in time (probabilistically), with a comment *'I hope at least that our work is correct and efficient'*, by T   ˇ B   ´   on runtime analysis of probabilistic programs, and by A   ´ K   ˇ   on termination of 1-counter stochastic games.

Good and interesting papers were presented by S   Z   on power of lower bound methods for quantum communication protocols, by C   K   -   on the importance of nondeterminism in 2-way finite automata, by L   C   , speaking rather fast, on quotients of nondeterministic Büchi automata, by D   X   on new bounds for randomized decision tree complexity, by J   W   on the Fourier entropy conjecture for certain classes of Boole'an functions, and by S   C   on probabilistic simulation and bisimulation algorithms using preorders.

Also to mention are the good talks by H   C   , on hardness results for expression complexity of comparison of equivalence and containment, finishing with *'Please, prove the conjecture'*, by M   A   on a locality result for queries definable in invariant first-order logic, by B   ^ L   on secure non-interactive threshold cryptosystems, by Y   F   on transformation of polynomial-size Frege proofs to subexponential-size AC^0-Frege proofs, by M   -   L   on parameterized bounded-depth Frege complexity, and by J   N   ¨ , starting with *'a low key talk'*, on minimal unsatisfiability and time-space trade-offs for k-DNF resolution.

F   B   , started with pictures of a bunny and R   H   , and finished with *'That's all folk'*. D´   M   showed up only in the last minute, and started with *'Since this is the last talk I have infinite time'*.

ICALP Contributors	
Kurt Mehlhorn	$12\frac{8}{15}$
Jean-Éric Pin	$11\frac{2}{3}$
Juhani Karhumäki	$9\frac{7}{60}$
Mihalis Yannakakis	$8\frac{3}{4}$
Zvi Galil	8
Amir Pnueli	$7\frac{1}{2}$
Christos Papadimitriou	$7\frac{1}{3}$
Philippe Flajolet	$7\frac{1}{4}$
Grzegorz Rozenberg	7
Paul Vitányi	$6\frac{11}{12}$
Claus-Peter Schnorr	$6\frac{1}{2}$
Torben Hagerup	$6\frac{1}{2}$
Géraud Sénizergues	$6\frac{1}{2}$
Burkhard Monien	$6\frac{19}{60}$
John Reif	$6\frac{1}{12}$
Karel Čulik II	6
Walter Vogler	6
Matthew Hennessy	6
Moti Yung	$5\frac{5}{6}$
Andrzej Lingas	$5\frac{7}{12}$
Joost Engelfriet	$5\frac{1}{2}$
Arto Salomaa	$5\frac{1}{2}$
Juris Hartmanis	$5\frac{1}{3}$
Michael Rabin	$5\frac{1}{3}$
Thomas Henzinger	$5\frac{1}{3}$
Leslie Valiant	$5\frac{1}{3}$
Ronald Book	$5\frac{1}{4}$
Christian Choffrut	5
Arnold Schönhage	5

Dominique Perrin	$4\frac{5}{6}$
Zohar Manna	$4\frac{5}{6}$
Bruno Courcelle	$4\frac{5}{6}$
Moshe Vardi	$4\frac{5}{6}$
Amin Coja-Oghlan	$4\frac{5}{6}$
Juraj Hromkovič	$4\frac{7}{10}$
Paul Spirakis	$4\frac{7}{10}$
David Peleg	$4\frac{7}{10}$
Thomas Wilke	$4\frac{2}{3}$
Thomas Colcombet	$4\frac{2}{3}$
Denis Thérien	$4\frac{7}{12}$
Sudipto Guha	$4\frac{7}{12}$
Piotr Berman	$4\frac{8}{15}$
Manfred Droste	$4\frac{1}{2}$
Robin Milner	$4\frac{1}{2}$
Mikołaj Bojańczyk	$4\frac{1}{2}$
Mark Jerrum	$4\frac{1}{2}$
Bernard Chazelle	$4\frac{10}{21}$
Ming Li	$4\frac{5}{12}$
James Laird	$4\frac{1}{3}$
Maurice Nivat	$4\frac{1}{4}$
Hans L. Bodlaender	$4\frac{1}{4}$
Ian Munro	$4\frac{1}{5}$
Volker Diekert	$4\frac{1}{6}$
Marek Karpiński	$4\frac{1}{6}$
Anca Muscholl	$4\frac{1}{12}$
Kim Guldstrand Larsen	$4\frac{1}{12}$
Christophe Reutenauer	4
Marcel Paul Schützenberger	4
Davide Sangiorgi	4
Colin Stirling	4
Rajeev Alur	4

The proceedings, edited by L   A   , M   H   , and J ˇ´ S   , have been published in two volumes: LNCS 6755, containing all contributions of track A, and 6756, containing the invited lectures, except for that by É   T   , all best student papers and best papers, and all contributions of tracks B and C.

The social program started on Sunday late afternoon with a welcome reception, which was also a reception for participants of the workshops. Red and white wine, beer, mineral water, juice, fruits, cheese, and bread were offered. It lasted well until 21.30h.

On Monday late afternoon we had an *Apéro* (reception) in *Dozentenfoyer* on the top level of ETHZ, with an excellent view over Zürich. Red and white wine, beer,, mineral water, juice, coffee, meat balls, lamb sticks, fruits, cheese, bread, and icecream were offered. It was about 21.30 h when the last participants left.

Wednesday afternoon was free with suggestions for an excursion as mentioned above. Only few participants went to G   M   since hiking shoes were needed for that. Another *Apéro* was given on Thursday late afternoon in *CABinett* in the CAB building. A music group from Z¨   H   K¨   , consisting of L   B ¨   , R   W   , R   J   , performed. Red and white wine, draught beer, mineral water, snacks, and tomato soup with wodka and basilicum were offered. It lasted until 21 h.

On the EATCS General Assembly on Tuesday late afternoon icecream was offered. Among other topics A   C   presented W   for ICALP 2012, and R¯¸´ F   R¯   for ICALP 2013. The editors of the proceedings were presented EATCS buttons by the author of this report. Unfortunately, no author surpassed 5 full papers on ICALP's to receive a button too. The present state of active authors is given in the table above. The assembly closed at 19.30 h.

In the coffee breaks coffee, tea, mineral water, juice, croissants, rolls, sandwiches, and fruits were offered. Lunch we had in the restaurant of U   ¨ Z¨   , about 5 minutes walk from ETHZ, where we had the choice between F   , V   , P   menu (meat, vegetarian, pasta).

Most participants stayed in hotels within 10 to 15 minutes walk from the conference site. Access to the internet was available on about 50 PC's in the conference building as wellas by wireless. As traditionally, there was a S   book exhibition again, represented by F   H   and A   H   . Except for a thunderstorm on Thursday evening, weather was warm and sunny, with highest temperatures between 25 and 30 °C.

ICALP 2011 was a successful conference, of high level and excellently organized, in a relaxed atmosphere. Next ICALP will be held at W   (C   ) from July 9-13, 2012.

Pictures of the conference can be found at `http://picasaweb.google.com/103109175860301247641?authkey=Gv1sRgCL_Z8LyayIfvFg`.

U W   , Z¨   and W   W   .