Foreword

The papers in these proceedings were presented at the 55th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2013) sponsored by the IEEE Technical Committee on Mathematical Foundations of Computing. The conference was held in Philadelphia, Pennsylvania on October 19–21, 2014. The program committee consisted of Scott Aaronson (Massachusetts Institute of Technology), Boaz Barak (Microsoft Research, program chair), Nikhil Bansal (Eindhoven University of Technology), Timothy Chan (University of Waterloo), Moses Charikar (Princeton University), Shuchi Chawla (University of Wisconsin - Madison), Julia Chuzhoy (Toyota Technological Institute at Chicago), Andrew Drucker (Institute for Advanced Study), Valerie King (University of Victoria), Robert Kleinberg (Cornell University), Eyal Kushilevitz (Technion), James R. Lee (University of Washington), Aleksander Mądry (EPFL), Raghu Meka (Microsoft Research), Ankur Moitra (Massachusetts Institute of Technology), Aaron Roth (University of Pennsylvania), Alexander Russell (University of Connecticut), David Steurer (Cornell University), Madhu Sudan (Microsoft Research), Kunal Talwar (Microsoft Research), Brent Waters (University of Texas — Austin), Ryan Williams (Stanford University), and David Woodruff (IBM Research, Almaden)

The committee met in Cambridge, MA, on June 21–22, 2014 (following an intensive period of electronic discussion), and selected the conference program which contains 68 papers out of the original 273 submissions. (Out of those original submissions, 6 were withdrawn during the review process, and two submissions were merged to a single paper.) Although the committee and reviewers did read the proofs for many of the submitted papers, in keeping with longstanding convention, the papers at the conference have not been formally refereed, and it is expected that extended versions of those papers (or at least most of them) will be published in journals, as well as be posted on freely available online archives.

The program committee selected the paper "Path-Finding Methods for Linear Programming: Solving Linear Programs in $\tilde{O}(\sqrt{\text{rank}})$ Iterations and Faster Algorithms for Maximum Flow" by Yin Tat Lee and Aaron Sidford to receive both the best paper award and the Machtey award for the best student-authored paper.

First, and foremost, I would like to thank the authors for their submissions. This includes also the authors of many excellent papers we were not able to include in the proceedings, but we still learned a lot from reading them and are grateful for the authors' effort. I would like to thank the program committee members for their hard work. Many PC members went above and beyond the call of duty, spending long hours verifying proofs, chasing down experts and references, and discussing the merits of papers, and the conference program is all the better due to their labor. The committee is grateful to the many external researchers, listed below, who helped us review the submitted papers and/or provided us with short opinions or pointers to related literature that greatly helped our review process. Thanks to Microsoft Research New England for hosting the meeting, and to Ankur Moitra for organizing a workshop the day before the meeting that made it much more enjoyable. I am grateful to the general chair David Shmoys and the local arrangements chairs Rebecca Wright and Lisa Zhang for their work and for their inputs. There are many other people that helped me or gave me advice during this process— I am grateful to them all. Two people I would like to specifically mention are Omer Reingold (the FOCS 2013 PC chair), on whom I relied for much advice and "borrowed" many ideas from, and Madhu Sudan, that agreed to join the committee after much begging on my part, and since then has been a consistent source of wisdom and perspective. Thanks to Eddie Kohler for developing hotcrp— the software we used— and to Moses Charikar and Joseph Crouthamel for hosting it at Princeton. Finally, I thank Randall Bilof of the IEEE Computer Society for his help in the production of this volume. There are many more people that helped with this process than I am able to thank here— if I omitted your name, or worse, misspelled it, please accept my sincere apologies.

September 2014   Boaz Barak
                                                                                              FOCS 2014 Program Chair

Organizing Committee and Sponsors

General Chair David Shmoys, Cornell University

Program Committee Chair Boaz Barak, Microsoft Research

Local Arrangements Chairs Rebecca Wright, Rutgers University and Lisa Zhang, Bell Labs.

Program Committee

Scott Aaronson	Massachusetts Institute of Technology
Boaz Barak	Microsoft Research, program chair
Nikhil Bansal	Eindhoven University of Technology
Timothy Chan	University of Waterloo
Moses Charikar	Princeton University
Shuchi Chawla	University of Wisconsin - Madison
Julia Chuzhoy	Toyota Technological Institute at Chicago
Andrew Drucker	Institute for Advanced Study
Valerie King	University of Victoria
Robert Kleinberg	Cornell University
Eyal Kushilevitz	Technion
James R. Lee	University of Washington
Aleksander Mądry	EPFL
Raghu Meka	Microsoft Research
Ankur Moitra	Massachusetts Institute of Technology
Aaron Roth	University of Pennsylvania
Alexander Russell	University of Connecticut
David Steurer	Cornell University
Madhu Sudan	Microsoft Research
Kunal Talwar	Microsoft Research
Brent Waters	University of Texas — Austin
Ryan Williams	Stanford University
David Woodruff	IBM Research, Almaden

External reviewers

The FOCS 2014 program committee is grateful to the following individuals for proving us with inputs on the submissions that greatly helped with the review process.

Amir Abboud	Fernando G.S.L. Brandão	Reinhard Diestel
Jacob Abernethy	Michael Brautbar	Martin Dietzfelbinger
Ittai Abraham	Mark Braverman	Ioanna Dimitriu
Anna Adamaszek	Sergey Bravyi	Michael Dinitz
Peyman Afshani	Guy Bresler	Irit Dinur
Pankaj Agarwal	Anne Broadbent	Shahar Dobzinski
Divesh Aggarwal	Sebastien Bubeck	Yevgenyi Dodis
Dorit Aharonov	Niv Buchbinder	Benjamin Doerr
Nir Ailon	Kevin Buchin	David Doty
Saeed Alaei	Harry Buhrman	John Duchi
Dan Alistarh	Andrei Bulatov	Shaddin Dughmi
Noga Alon	Peter Burgisser	Ioana Dumitriu
Kazuyuki Amano	Sam Buss	Zeev Dvir
Animashree Anandkumar	Ran Canetti	Lili Dworkin
Alexandr Andoni	Amit Chakrabarti	Martin Dyer
Matthew Andrews	Siu On Chan	Sarah Eisenstat
Benny Applebaum	Siu Man Chan	Michael Elkin
Alex Arkhipov	T.-H. Hubert Chan	Faith Ellen
Sanjeev Arora	Krishnendu Chatterjee	Alina Ene
V. Arvind	Bernard Chazelle	Matthias Englert
Jim Aspnes	Shiri Chechik	David Eppstein
Pranjal Awasthi	Chandra Chekuri	Leah Epstein
Moshe Babaioff	Ning Chen	Funda Ergun
Ashwin Badanidiyuru	Tzu-Yi Chen	Kousha Etessami
Yakov Babichenko	Xi Chen	Esther Ezra
Michel Baes	Yijia Chen	Piotr Faliszewski
Jeremy Barbay	Bogdan Chlebus	Rui Fan
Alexander Barvinok	Matthias Christandl	Sebastian Faust
Surendra Baswana	Kai-Min Chung	Serge Fehr
Paul Beame	Ken Clarkson	Uri Feige
Chris Beck	Richard Cleve	Michal Feldman
Alexander Belov	Thomas Colcombet	Moran Feldman
Shai Ben-David	Richard Cole	Vitaly Feldman
Michael Bender	Rachel Cummings	Yuval Filmus
Anand Bhaskar	Marek Cygan	Joe Fitzsimons
Aditya Bhaskara	Artur Czumaj	Michael Forbes
Arnab Bhattacharyya	Dana Dachman-Soled	Dean Foster
Abhishek Bhowmick	Ivan Damgård	Jacob Fox
Markus Blaeser	Amit Daniely	Kyle Fox
Eric Blais	Constantinos Daskalakis	Nathanael Francois
Avrim Blum	Anindya De	Cameron Freer
Hans Bodlaender	Ofer Dekel	Robert Freund
Christian Borgs	Erik Demaine	Alan Frieze
Glencora Borradaile	Jim Demmel	Rafael Frongillo
Elette Boyle	Nikhil Devanur	Hu Fu
Zvika Brakerski	Ilias Diakonikolas	Ben Fuller

Tommaso Gagliardoni	Sandy Irani	Shachar Lovett
Nicola Galesi	Yuval Ishai	Steve Lu
David Gamarnik	Abhishek Jain	Brendan Lucier
Ankit Garg	Rahul Jain	Frederic Magniez
Jugal Garg	Petr Jancar	Mohammad Mahmoody
Naveen Garg	Svante Janson	Konstantin Makarychev
Sanjam Garg	Jeanette Janssen	Yury Makarychev
Serge Gaspers	Mark Jerrum	Rajsekar Manokaran
Cyril Gavoille	Brendan Juba	Daniel Marx
Paweł Gawrychowski	Valentine Kabanets	Laurent Massoulie
Rong Ge	Yael Kalai	Claire Mathieu
Ran Gelles	Bahman Kalantari	Jiri Matousek
Shayan Oveis Gharan	Satyen Kale	Andrew McGregor
Seth Gibert	Gautam Kamath	Aranyak Mehta
Gagan Goel	Varun Kanade	Ruta Mehta
Paul Goldberg	Daniel Kane	Or Meir
Parikshit Gopalan	Ravi Kannan	Michael Mitzenmacher
Lee-Ad Gottlieb	Sampath Kannan	Matthias Mnich
Vipul Goyal	Michael Kapralov	Tobias Moemke
Fabrizio Grandoni	Anna Karlin	Bojan Mohar
Nick Gravin	Jonathan Katz	Mike Molloy
Martin Grohe	Neeraj Kayal	Cris Moore
Misha Gromov	Michael Kearns	Cristopher Moore
Anupam Gupta	Jonathan Kelner	Shay Moran
Venkatesan Guruswami	David Kempe	Jamie Morgenstern
Dan Gusfield	Julia Kempe	Benjamin Moseley
Gus Gutoski	Iordanis Kerenidis	Eclhanan Mossel
Bernhard Haeupler	Sanjeev Khanna	Ian Munro
Mohammadtaghi Hajiaghayi	Subhash Khot	Nabil H. Mustafa
Thomas Dueholm Hansen	Guy Kindler	Yonatan Naamad
Sariel Har-Peled	David Kirkpatrick	Assaf Naor
Moritz Hardt	Hartmut Klauck	Seffi Naor
Aram Harrow	Phil Klein	Gonzalo Navarro
Jason Hartline	Jochen Könemann	Amir Nayyeri
Johan Håstad	Gillat Kol	Jelani Nelson
Matt Hastings	Antonina Kolokolova	Arkadi Nemirovski
Pinar Heggernes	Scott Kominers	Yurii Nesterov
Hoda Heidari	Swastik Kopparty	Praneeth Netrapalli
Brett Hemenway	Stefan Kratsch	Huy Nguyen
Danny Hendler	Robert Krauthgamer	Valeria Nikolaenko
Monika Henzinger	Ravishankar Krishnaswamy	Noam Nisan
Danny Hermelin	Fabian Kuhn	Ryan O'Donnell
Mike Hochman	Amit Kumar	Krzysztof Oleszkiewicz
Martin Hoefer	Kasper Green Larsen	Krzysztof Onak
Sam Hopkins	Troy Lee	Rotem Oshman
Pavel Hrubes	Renato Paes Leme	Omkant Pandey
Justin Hsu	Kevin Lewi	Omer Paneth
Zhiyi Huang	Allison Lewko	Christos Papadimitriou
Leo van Iersel	Shi Li	Rafael Pass
Sungjin Im	Xin Li	Christophe Paul
Nicole Immorlica	Yi Li	David Peleg
Russell Impagliazzo	Huijia (Rachel) Lin	Victor de la Pena
Piotr Indyk	Nati Linial	Richard Peng

Seth Pettie
Jeff Phillips
Chris Piekert
Giovanni Pighizzini
Georgios Piliouras
Marcin Pilipczuk
Nicholas Pippinger
Toniann Pitassi
Oxana Poburinnaya
Eric Price
Rasmus Pugh
Yuval Rabani
Tal Rabin
Harald Raecke
Prasad Raghavendra
Ananth Raghunathan
Sanguthevar Rajasekaran
Kannan Ramchandran
Dana Randall
Anup Rao
Satish Rao
Sofya Raskhodnikova
Oded Regev
Ben Reichardt
Omer Reingold
James Renegar
Leonid Reyzin
David Richerby
Sebastien Roch
Daniel Roche
Liam Roditty
Heiko Röglin
Alon Rosen
Peter Rossmanith
Guy Rothblum
Thomas Rothvoss
Tim Roughgarden
Yannis Rouselakis
Ronitt Rubinfeld
Aviad Rubinstein
Sushant Sachdeva
Jared Saia
Rishi Saket
Piotr Sankowski
Rahul Santhanam
Shubhangi Saraf
Or Sattath
Rahul Savani
Christian Schaffner

Michael Schapira
Leonard Schulman
Roy Schwartz
Pascal Schweitzer
Robert Schweller
Rocco Servedio
C. Seshadri
Shai Shalev-Shwartz
Jeff Shallit
Ronen Shaltiel
Asaf Shapira
Don Sheehy
Bruce Shepherd
Alexander Sherstov
Amir Shpilka
Alistair Sinclair
Yaron Singer
Mohit Singh
Ali Kemal Sinop
Balu Sivan
Adam Smith
Christian Sohler
Shay Soloman
Florian Speelman
Daniel Spielman
Karthik Sridharan
Srikanth Srinivasan
Venkatesh Srinivasan
Nikhil Srivastava
Piyush Srivastava
Mike Steel
Cliff Stein
Martin Strauss
He Sun
Ola Svensson
Chaitanya Swamy
Vasilis Syrgkanis
Omer Tamuz
Li Yang Tan
Shanghua Teng
Stefano Tessaro
Justin Thaler
Konstantin Tsakalidis
Jonathan Ullman
Chris Umans
Seeun Umboh
Kasturi Vadarajaran
Salil Vadhan
Vinod Vaikuntanathan

Ali Vakilian
Gregory Valiant
Paul Valiant
Kasturi Varadarajan
Stephen Vavasis
Laszlo Vegh
Kolya Vereshchagin
Thomas Vidick
Aravindan Vijayaraghavan
Emanuele Viola
Jan Vondrak
Pascal Vontobel
Magnus Wahlström
Carol Wang
Josh Wang
John Watrous
Omri Weinstein
Carola Wenk
Daniel Wichs
Andreas Wiese
Avi Wigderson
Virginia Vassilevska Williams
Erik Winfree
Andrew Winslow
Gerhard J. Woeginger
Philipp Woelfel
Ronald De Wolfe
Paul Wollan
John Wright
Zhiwei Steven Wu
Christian Wulff-Nielson
Lirong Xia
Mihalis Yannakakis
Jon Yard
Grigory Yaroslavtsev
Amir Yehudayoff
Ke Yi
Maxwell Young
Ching-Hua Yu
Huacheng Yu
Christos Zaroliagis
Alex Zelkovsky
Noga Zewi
Mark Zhandry
Qin Zhang
Yuan Zhou
Joel Zinn
Uri Zwick

Awards

Best Paper Award and the Machtey Award for Best Student Paper The program committee of FOCS 2014 gives the Best Paper award, as well as the Machtey Award for the best paper written solely by one or more students, to Yin Tat Lee and Aaron Sidford for their paper "Path-Finding Methods for Linear Programming: Solving Linear Programs in $\tilde{O}(\sqrt{\text{rank}})$ Iterations and Faster Algorithms for Maximum Flow"