

31st Annual IEEE Symposium on Foundations of Computer Science

October 22-24, 1990
St. Louis, Missouri

SUNDAY, OCTOBER 21, 1990

Reception, 8pm - 10pm

MONDAY, OCTOBER 22, 1990

Session 1A, 8:45am - 10:20am

Chair: Mihalis Yannakakis, AT&T Bell Labs

8:45 *Algebraic Methods for Interactive Proof Systems*, Carsten Lund, Lance Fortnow and Howard Karloff, U. Chicago; Noam Nisan, Hebrew U.

9:10 *IP=PSPACE*, Adi Shamir, Weizmann Institute

9:35 *Non-Deterministic Exponential Time has Two-Prover Interactive Protocols*, László Babai, Eötvös and U. Chicago; Lance Fortnow and Carsten Lund, U. Chicago

10:00 *A Characterization of #P by Straight Line Programs of Polynomials*, László Babai, Eötvös and U. Chicago; Lance Fortnow, U. Chicago

Session 1B, 8:45am - 10:20am

Chair: Richard Ladner, University of Washington, Seattle

8:45 *Perfectly Secure Message Transmission*, Danny Dolev and Cynthia Dwork, IBM Almaden; Orli Waarts, Stanford; Moti Yung, IBM
T.J. Watson

9:10 *Coin-flipping Games Immune Against Linear-sized Coalitions*, Noga Alon, IBM Almaden and Tel Aviv; Moni Naor, IBM Almaden

9:35 *Are Wait-Free Algorithms Fast?*, Hagit Attiya and Nancy Lynch, MIT; Nir Shavit, IBM Almaden and Stanford

10:00 *A Dining Philosophers algorithm with polynomial response time*, Baruch Awerbuch, MIT; Michael Saks, U.C. San Diego

Coffee Break, 10:20am - 10:40am

Session 2A, 10:40am - 12:15pm

Chair: David Dobkin, Princeton University

10:40 *An Approach for Proving Lower Bounds: Solution of Gilbert-Pollak Conjecture on Steiner Ratio*, Ding-Zhu Du, Princeton and Academia Sinica; F. K. Hwang, AT&T Bell Labs

11:05 *Drawing Graphs in the Plane With High Resolution*, M. Formann, FU Berlin; T. Hagerup, U. des Saarlandes; J. Haralambides, U. Texas, Dallas; F. T. Leighton, MIT; A. Simvonis, U. Texas, Dallas; E. Welzl, FU Berlin; G. Woeginger, TU Graz

11:30 *New Results on Dynamic Planar Point Location*, Siu Wing Cheng and Ravi Janardan, Minnesota

11:55 *The Computability and Complexity of Optical Beam Tracing*, John H. Reif, Duke; J. D. Tygar, Carnegie-Mellon; Akitoshi Yoshida, Duke

Session 2B, 10:40am - 12:15pm

Chair: Greg Frederickson, Purdue University

10:40 *Approximate String Matching in Sublinear Expected Time*, William I. Chang and Eugene L. Lawler, U.C. Berkeley

11:05 *Towards a DNA Sequencing Theory*, Ming Li, Waterloo

11:30 *On the Exact Complexity of String Matching*, Livio Colussi, Padova; Zvi Galil, Columbia and Tel Aviv; Raffaele Giancarlo, Columbia and Palermo

11:55 *Faster Tree Pattern Matching*, Moshe Dubiner, Tel Aviv; Zvi Galil, Columbia and Tel Aviv; Edith Magen, Tel Aviv

Lunch, 12:20pm - 2:00pm

Session 3A, 2:00pm - 3:35pm

Chair: Gary Miller, Carnegie-Mellon

2:00 *Specified Precision Polynomial Root Isolation is in NC*, C. Andrew Neff, IBM T.J. Watson

2:25 *A Tree-Partitioning Technique With Applications to Expression Evaluation and Term Matching*, S. Rao Kosaraju and Arthur L. Delcher, Johns Hopkins

2:50 *Efficient Parallel Algorithms for Tree-Decomposition and Related Problems*, Jens Lagergren, Royal Institute of Technology, Stockholm

3:15 *Some Triply-Logarithmic Parallel Algorithms*, Omer Berkman, Maryland and Tel Aviv; Joseph JaJa, Sridhar Krishnamurthy and Ramakrishna Thurimella, Maryland; Uzi Vishkin, Maryland and Tel Aviv

Session 3B, 2:00pm - 3:35pm

Chair: Jeff Vitter, Brown University

2:00 *Learning Conjunctions of Horn Clauses*, Dana Angluin, Yale; Michael Frazier and Leonard Pitt, Illinois, Urbana

2:25 *Exact Identification of Circuits Using Fixed Points of Amplification Functions*, Sally A. Goldman, Michael J. Kearns and Robert E. Schapire, MIT

2:50 *On the Complexity of Learning from Counterexamples and Membership Queries*, Wolfgang Maass, Illinois, Chicago; György Turán, Illinois, Chicago

3:15 *Separating PAC and Mistake-Bound Learning Models over the Boolean Domain*, Avrim Blum, MIT

Coffee Break, 3:35pm - 4:00pm

Session 4A, 4:00pm - 5:35pm

Chair: David Dobkin, Princeton University

4:00 *Efficient Polygon Triangulation*, Bernard Chazelle, Princeton

4:25 *Provably Good Mesh Generation*, Marshall Bern, David Eppstein and John Gilbert, Xerox

4:50 *Counting and Cutting Cycles of Lines and Rods in Space*, Bernard Chazelle, Princeton; Herbert Edelsbrunner, Illinois, Urbana; Leonidas J. Guibas, MIT and DEC; Richard Pollack, Courant; Raimund Seidel, U.C. Berkeley; Micha Sharir, Tel Aviv; Jack Snoeyink, Stanford

5:15 *Hidden Surface Removal for Axis-parallel Polyhedra*, Mark de Berg and Mark H. Overmars, Utrecht

Session 4B, 4:00pm - 5:35pm

Chair: Vijaya Ramachandran, University of Texas, Austin

4:00 *A (fairly) Simple Circuit that (usually) Sorts*, Tom Leighton and C. Greg Plaxton, MIT

4:25 *Fault Tolerant Sorting Network*, Shay Assaf, Weizmann; Eli Upfal, IBM Almaden and Weizmann

4:50 *Asymptotically Tight Bounds for Computing with Faulty Arrays of Processors*, C. Kaklamani, Harvard; A. R. Karlin, DEC SRC; F. T. Leighton, MIT; V. Milenkovic, Harvard; P. Raghavan, IBM T.J. Watson; S. Rao, Harvard; C. Thomborson, Minnesota; A. Tsantilas, Harvard

5:15 *Deterministic On-Line Routing on Area-Universal Networks*, Paul Bay and Gianfranco Bilardi, Cornell

Banquet, St. Louis Zoo

Buses leave the hotel at 6:00pm

TUESDAY, OCTOBER 23, 1990

Session 5A, 8:45am - 10:20am

Chair: Michael Luby, ICSI, Berkeley

- 8:45 *Multiple Non-Interactive Zero Knowledge Proofs Based on a Single Random String*, Uriel Feige, Drop Lapidot and Adi Shamir, Weizmann Institute
- 9:10 *Security Preserving Amplification of Hardness*, Oded Goldreich, Technion; Russell Impagliazzo, Toronto; Leonid A. Levin and Ramarathnam Venkatesan, Boston U.; David Zuckerman, U.C. Berkeley
- 9:35 *Efficiently Inverting Bijections Given by Straight Line Programs*, Carl Sturtevant and Zhi-Li Zhang, Aarhus and Carnegie Mellon
- 10:00 *Private Computations Over the Integers*, Benny Chor, Technion; Mihaly Gerek-Graus, Tufts; Eyal Kushilevitz, Technion

Session 5B, 8:45am - 10:20am

Chair: Greg Frederickson, Purdue University

- 8:45 *The Mixing Rate of Markov Chains, an Isoperimetric Inequality, and Computing the Volume*, László Lovász, Eötvös and Princeton; Miklós Simonovits, Hungarian Academy and Rutgers
- 9:10 *Exploring an Unknown Graph*, Xiaotie Deng and Christos H. Papadimitriou, U.C. San Diego
- 9:35 *Inferring Evolutionary History from DNA Sequences*, Sampath Kannan and Tandy J. Warnow, U.C. Berkeley
- 10:00 *In-Place Rearrangement of Data*, Faith E. Fich, Toronto; J. Ian Munro, Waterloo; Patricio V. Poblete, U. of Chile

Coffee Break, 10:20am - 10:40am

Session 6A, 10:40am - 12:15pm

Chair: Jeff Vitter, Brown University

- 10:40 *Efficient Distribution-free Learning of Probabilistic Concepts*, Michael J. Kearns and Robert E. Schapire, MIT
- 11:05 *A Markovian Extension of Valiant's Learning Model*, David Aldous and Umesh Vazirani, U.C. Berkeley
- 11:30 *On Threshold Circuits for Parity*, Ramamohan Paturi and Michael E. Saks, U.C. San Diego
- 11:55 *Robust Separations in Inductive Inference*, Mark A. Fulk, Rochester

Session 6B, 10:40am - 12:15pm

Chair: Gary Miller, Carnegie-Mellon

- 10:40 *A Time Space Tradeoff for Boolean Matrix Multiplication*, Karl Abrahamson, Washington State, Pullman
- 11:05 *Communication-Space Tradeoffs for Unrestricted Protocols*, Paul Beame, Washington, Seattle; Martin Tompa, Washington, Seattle and IBM T.J. Watson; Peiyuan Yan, Lycoming
- 11:30 *Time-Space Tradeoffs for Undirected Graph Traversal*, Paul Beame, Washington, Seattle; Allan Borodin, Toronto; Prabhakar Raghavan, IBM T.J. Watson; Walter L. Ruzzo, Washington, Seattle; Martin Tompa, Washington, Seattle and IBM T.J. Watson
- 11:55 *Constructing Polynomial Universal Traversing Sequences for Graphs with Small Diameter*, Sorin Istrail, Wesleyan

Lunch, 12:20pm - 2:00pm

Session 7A, 2:00pm - 3:35pm

Chair: Vijay Vazirani, Cornell University

- 2:00 *Competitive k-Server Algorithms*, Amos Fiat, Yuval Rabani and Yiftach Ravid, Tel-Aviv
- 2:25 *Randomized Online Coloring of Graphs*, S. Vishwanathan, U. Chicago
- 2:50 *Coloring Inductive Graphs On-line*, Sandy Irani, U.C. Berkeley
- 3:15 *Online Algorithms for Finger Searching*, Richard Cole and Arvind Raghunathan, Courant

Session 7B, 2:00pm - 3:35pm

Chair: Michael Luby, ICSI, Berkeley

- 2:00 *Optimal Maintenance of Replicated Information*, Baruch Awerbuch, MIT; Israel Cidon and Shay Kutten, IBM T.J. Watson
- 2:25 *Sparse Partitions*, Baruch Awerbuch, MIT; David Peleg, Weizmann
- 2:50 *Network Synchronization with Polylogarithmic Overhead*, Baruch Awerbuch, MIT; David Peleg, Weizmann
- 3:15 *Reliability of Distributed Networks via Network Decomposition*, Arkady Kanevsky, Texas A&M

Coffee Break, 3:35pm - 4:00pm

Session 8A, 4:00pm - 5:35pm

Chair: Vijay Vazirani, Cornell University

- 4:00 *General Weak Random Sources*, David Zuckerman, U.C. Berkeley
- 4:25 *A Simple Construction of Almost k-wise Independent Random Variables*, Oded Goldreich, Technion; Johan Hastad, Royal Institute of Technology, Stockholm
- 4:50 *Some Tools for Approximate 3-Coloring*, Avrim Blum, MIT
- 5:15 *Randomness in Interactive Proofs*, Mihir Bellare, MIT; Oded Goldreich, Technion; Shafi Goldwasser, MIT

Session 8B, 4:00pm - 5:35pm

Chair: Vijaya Ramachandran, University of Texas, Austin

- 4:00 *Parallel Linear Programming in Fixed Dimension Almost Surely in Constant Time*,
Noga Alon and Nimrod Megiddo, IBM Almaden and Tel Aviv
- 4:25 *Reducing the Parallel Complexity of Certain Linear Programming Problems*, Pravin M. Vaidya, Illinois, Urbana
- 4:50 *Asynchronous PRAMs are (almost) as Good as Synchronous PRAMs*, Charles Martel, Ramesh Subramonian and Arvin Park, U.C. Davis
- 5:15 *Uniform Memory Hierarchies*, Bowen Alpern, Larry Carter and Ephraim Feig, IBM T.J. Watson

Business Meeting: 9:00pm - 11:00pm, Missouri Room

WEDNESDAY, OCTOBER 24, 1990

Session 9A, 8:45am - 10:45am

Chair: Michael Luby, ICSI, Berkeley

- 8:45 *On the Power of Small-Depth Threshold Circuits*, Johan Hastad and Mikael Goldman, Royal Institute of Technology, Stockholm
- 9:10 *On ACC and Threshold Circuits*, Andrew Chi-Chih Yao, Princeton
- 9:35 *On Interpolation by Analytic Functions with Special Properties and Some Weak Lower Bounds on the Size of Circuits with Symmetric Gates*, Roman Smolensky, Toronto

10:00 *Polynomial Threshold Functions, AC^0 Functions and Spectral Norms*, Jehoshua Bruck, IBM Almaden; Roman Smolensky, Toronto

10:25 *Faster Circuits and Shorter Formulae for Multiple Addition, Multiplication and Symmetric Boolean Functions*, Michael S. Paterson, Warwick; Nicholas Pippenger, U. British Columbia; Uri Zwick, Warwick

Session 9B, 8:45am - 10:45am

Chair: Richard Ladner, University of Washington, Seattle

8:45 *Deciding Properties of Nonregular Programs*, David Harel and Danny Raz, Weizmann Institute

9:10 *Decision Problems for Propositional Linear Logic*, Patrick D. Lincoln, Stanford and SRI; John Mitchell, Stanford; Andre Scedrov, Stanford and U. Pennsylvania; Natarajan Shankar, SRI

9:35 *Tight Bounds on the Complexity of Cascaded Decomposition of Automata*, Oded Maler and Amir Pnueli, Weizmann

10:00 *Finite-Memory Automata*, Michael Kaminski and Nissim Francez, Technion

10:25 *Probabilities of Sentences about Very Sparse Random Graphs*, James F. Lynch, Clarkson

Coffee Break, 10:45am- 11:05am

Session 10A, 11:05am - 12:40pm

Chair: Vijay Vazirani, Cornell University

11:05 *A Fast Algorithm for Optimally Increasing the Edge-Connectivity*, Dalit Naor, D. Gusfield and C. Martel, U.C. Davis

11:30 *Augmenting Graphs to Meet Edge-Connectivity Requirements*, Andras Frank, Bonn and Eötvös

11:55 *Trans-dichotomous Algorithms for Minimum Spanning Trees and Shortest Paths*, Michael L. Fredman, U.C. San Diego, Rutgers and Bellcore; Dan E. Willard, S.U.N.Y

12:20 *Approximation through Multicommodity Flow*, P. Klein, Ajit Agrawal and Ravi Ramamurthy, Brown; S. Rao, Harvard

Session 10B, 11:05am - 12:40pm

Chair: Richard Ladner, University of Washington, Seattle

11:05 *Computing with Snakes in Directed Networks of Automata*, Shimon Even, Technion and Bellcore; Ami Litman, Bellcore; Peter Winkler, Emory and Bellcore

11:30 *Distributed Reactive Systems are Hard to Synthesize*, Amir Pnueli and Roni Rosner, Weizmann Institute

11:55 *Communication Complexity of Algebraic Computation*, Zhi-Quan Luo, Mc Master U.; John N. Tsitsiklis, MIT

12:20 *Bounds on Tradeoffs between Randomness and Communication Complexity*, Ran Canetti and Oded Goldreich, Technion

Lunch, 12:45pm - 2:15pm

Session 11A, 2:15pm - 4:15pm

Chair: Mihalis Yannakakis, AT&T Bell Labs

2:15 *The Complexity of Finding Medians*, Seinosuke Toda, Univ. of Electro-Communications, Tokyo

2:40 *On the Predictability of Coupled Automata: an Allegory about Chaos*, Sam Buss and Christos H. Papadimitriou, U.C. San Diego; John Tsitsiklis, MIT

3:05 *On Graph-theoretic Lemmata and Complexity Classes*, Christos H. Papadimitriou, U.C. San Diego

3:30 *Matrix Decomposition Problem is Complete for the Average Case*, Yuri Gurevich, Michigan, Ann Arbor

3:55 *No Better Ways to Generate Hard NP Instances than Picking Uniformly at Random*,

Russell Impagliazzo, Toronto; Leonid A. Levin, Boston U.

Session 11B, 2:15pm - 4:15pm

Chair: Gary Miller, Carnegie-Mellon

2:15 *Complexity of Unification in Free Groups and Free Semi-groups*, Antoni Koscielski, Wroclaw; Leszek Pacholski, Polish Academy

2:40 *The Lattice Reduction Algorithm of Gauss: An Average Case Analysis*, Brigitte Vallee, U. Caen; Philippe Flajolet, INRIA

3:05 *Interpolation of Sparse Rational Functions Without Knowing Bounds on Exponents*, Dima Yu. Grigoriev, Soviet Academy; Marek Karpinski, Bonn and ICSI, Berkeley; Michael F. Singer, N.C. State, Raleigh

3:30 *Simplifying Nested Radicals and Solving Polynomials by Radicals in Minimum Depth*, Gwoboa Horng and Ming-Deh A. Huang, U. of Southern California

3:55 *On the Diameter of Finite Groups*, L. Babai, Eötvös and U. Chicago; G. Hetyei, Hungarian Academy; W.M. Kantor, U. Oregon; A. Lubotzky, Hebrew U.; A. Seress, Ohio State

GENERAL INFORMATION

Conference Registration: The regular registration fee includes: reception, 3 lunches, banquet, coffee breaks and the proceedings. Student registration fee includes: reception, 3 lunches, coffee breaks and proceedings, but not the banquet. There will be registration in the meeting level lobby on Sunday, October 21 from 8:00 to 10:00 pm. From Monday to Wednesday, there will be a registration and information desk in the meeting level lobby from 8:00 to 5:00.

Hotel Information: The conference will be held at the Clarion Hotel, St. Louis which is located in the center of town directly across from the Gateway Arch and the Mississippi River, one block from Busch Stadium and close to a large selection of restaurants and shopping areas. A block of rooms is being held for the symposium until September 23, 1990. The symposium rate will be honored up to three days prior to and three days following the symposium. Reservations received after the block of rooms is full or after the cutoff date are subject to space availability. Check-in time is 2:00 pm and check-out time is 12:00 noon.

Child care service is available through a local agency, TLC for Kids; 7301 Tulane Avenue, St. Louis, MO 63130; 314-725-5660. It would be best to contact them in early October.

Transportation: If you are flying you will arrive at Lambert-St. Louis Airport which is about 10 miles from downtown. The airport limousine service leaves the airport every 20 minutes on the hour from outside the baggage claim area (exit 13), from 6:40 am to 10:00 pm. It stops at all the major downtown hotels and the one-way cost is \$6.00. A taxi to the Clarion costs about \$15.

If you choose to drive from the airport, go east on I-70; exit onto Third Street just as you approach the Arch and proceed south. You will see the Clarion on your right; it has a tall circular tower and a short squat one. Proceed past the hotel to Spruce, turn right and then right again on Fourth to enter the hotel. The parking garage is directly across the street and the fee is \$8.50 per day.

Information about St. Louis: Saint Louis is a great place to visit with a variety of different activities. The Gateway Arch offers an excellent view of the city and includes a cultural museum at its base. Laclede's Landing just north of the Arch grounds offers a fine selection of restaurants and shops. The Saint Louis Symphony Orchestra, conducted by Leonard Slatkin is considered one of the world's best and holds its concerts in Powell Symphony Hall, which is a ten minute drive from the Clarion. There are many fine theaters in the area, with the St. Louis Repertory Theater, on the Webster University campus, being one of the best. Busch Stadium, the home of the Cardinals is one block from the hotel; while the Cardinals look like a poor bet to be in the World Series this year, die-hard fans are not counting them

out. The Anheuser-Busch Brewery, close to downtown, offers an interesting tour for visitors, which concludes with free samples in their hospitality lounge. The Botanical Garden in south Saint Louis has lovely grounds with both indoor and outdoor displays of plants from around the world and plays an important role in botanical research. The Saint Louis Zoo, Art Museum and Science Center are all in Forest Park, about 20 minutes from downtown. Just beyond Forest Park is the campus of Washington University. The daytime temperatures in late October are typically around 60 (16C) with about a 60% chance of sunshine.

Conference Events: There will be a reception on Sunday, October 21 from 8pm to 10pm. The banquet will be held on Monday, October 22, at the St. Louis Zoo's new Living World Exhibit. The buses will leave the hotel at 6pm. There will be a business meeting on Tuesday, October 23 at 9pm in the Missouri room. All registered participants are invited.

Machtley Award: The Machtley Award is presented for the most outstanding paper written by a student or collaboration of students, as judged by the Program Committee. The award includes a grant to help defray expenses incurred in attending the FOCS Symposium. Please consider making a donation to the Machtley Award Fund so that this award tradition can be sustained. All donations should be made payable to the Machtley Award Fund on a separate check and sent with the Advance Registration Form.

Further Information: For further information, contact Jonathan Turner, Computer Science Department, Washington University, Campus Box 1045, One Brookings Drive, St. Louis, MO 63130-4899. Phone 314-889-6193, FAX 314-726-7302, email jst@wucs1.wustl.edu.

CONFERENCE ORGANIZATION

Local Arrangements Chair: Jonathan Turner, Computer Science Department, Washington University, St. Louis, MO 63130-4899.

Technical Committee Chair: Christos Papadimitriou, Department of Computer Science, University of California at San Diego, La Jolla, CA 92037.

Publicity Chair: Michael A. Berman, Department of Computer Science, Glassboro State College, Glassboro, NJ 08028.

Symposium Coordinator: David Shmoys, School of Operations Research, Cornell University, Ithaca, NY 14853.

Program Committee Chair: Mihalis Yannakakis, AT&T Bell Laboratories, Murray Hill, NJ 07974.

Program Committee: Don Coppersmith, David Dobkin, Greg Frederickson, David Haussler, Richard Ladner, Michael Luby, Gary Miller, Vijaya Ramachandran, Larry Stockmeyer, Moshe Vardi, Vijay Vazirani, Jeff Vitter and Mihalis Yannakakis.

ADVANCE REGISTRATION FORM, FOCS 90

Registration Fee	By 9/21	After 9/21
IEEE or ACM/SIGACT member	\$220	\$320
Nonmember	\$300	\$400
Student	\$100	\$120

Specify your membership number: _____

Additional banquet tickets are \$40 each.

Name _____

Affiliation _____

Address _____

Phone _____ Email _____

Dietary restrictions: Kosher Vegetarian

Machtey Fund Contribution \$ _____

Fill out the above registration form and mail with check to:

IEEE FOCS 90
c/o Jonathan Turner
Washington University
Computer and Communications Research Center
Campus Box 1115
One Brookings Drive
St. Louis, MO 63130-4899

HOTEL RESERVATION FORM, FOCS 90

Clarion Hotel
314-241-9500 or 800-325-7353

Accommodations desired:

Single \$68 Triple \$83

Double \$68 Quad \$98

Name _____

Sharing with _____

Affiliation _____

Address _____

Daytime phone number _____

Arrival date and time _____

Departure date and time _____

Check-in time is 2pm. Arrivals after 6pm must guarantee first night's accommodations with check, money order, or major credit card.

Credit card company _____

Card number _____

Expiration date _____

Signature _____

Send this form to: Clarion Hotel
 Reservations
 200 South Fourth Street
 St. Louis, MO 63102

Reservations received after the contracted block of rooms is full or after the cut-off date of September 23, 1990 are subject to space availability.