

FOCS '93

34th Annual IEEE Conference on Foundations of Computer Science

November 3–5, 1993
Palo Alto, California

Sponsored by
The IEEE Computer Society
In cooperation with ACM SIGACT

Registration for FOCS '93

The registration fees for FOCS '93 are listed below. To qualify for the early registration fee, your registration application must be postmarked by **Friday, October 8**. Refund requests will be honored until October 22. The non-student registration fee includes the Tuesday night reception, the Wednesday night business meeting, the Thursday night banquet, coffee breaks and lunches, and a copy of the proceedings. The student fee includes all of the above except the banquet.

Please fill out the form below and send it, along with a check or money order (in US \$, drawn on a US bank) made payable to "IEEE - FOCS Symposium," to:

Andrei Broder
Attn: FOCS registration
DEC-Systems Research Center
130 Lytton Ave.
Palo Alto, CA 94301

Name _____
Affiliation _____
Street Address _____
City _____ State _____
ZIP or Country & Postal code _____
E-mail _____
Phone _____

Please circle one category below and fill in your membership number if appropriate: # _____

Category	Fee	After 10/8
ACM or SIGACT member	265	320
IEEE or EATCS member	265	320
Author or Program Committee	265	320
Student	110	130
Other	330	400

Extra Banquet Tickets ____ ×\$50 each = _____
Total registration _____

Machtey Fund Contributions (\$5 suggested) _____
(Make separate check to Machtey Award Fund)

Dietary restrictions: Kosher ____ Vegetarian ____ None ____

Special needs (attach letter if necessary) _____

Hotel Reservations

The conference will be held at the Holiday Inn in Palo Alto. The rates for FOCS '93 are posted below and apply from Sunday, October 31 through Monday, November 8. Check-in time is 3 PM and check-out is 12 noon. Please advise the hotel of late arrival. Free parking is available for all guests.

Reservations should be made by **Tuesday, October 12**. Reservations made after that will be accepted on a rate and space availability basis. Refer to FOCS '93 when making your reservations to obtain the rates listed.

To make your reservations by phone, call (415) 328-2800 or (800) 874-3516. To make reservations by mail, fill out the form below and send it to the address below. A deposit in the form of a check or money order (in US \$, drawn on a US bank) for one night's stay, or credit card information must be included. When filling out the form, make sure that you list your name exactly as it appears on your check or credit card. The following credit cards are accepted: American Express, Diners Club, Visa, MasterCard, and Discover. Deposits will be refunded if the hotel is notified prior to 6:00 p.m. on the day of your specified arrival.

Holiday Inn Palo Alto
Attn: FOCS '93 Reservations
625 El Camino Real
Palo Alto, CA 94301

Please check one:

Single \$94 _____ Double \$104 _____

Arrival Date: _____ Departure Date: _____

Please fill out:

Name _____

Address _____

_____ Phone _____

Sharing room with _____

If paying for deposit by credit card please complete:

Credit Card Type _____

Credit Card Number _____

Expiration Date _____

I authorize Holiday Inn to charge the above account for the amount equal to one night's stay as deposit.

Signature _____

WEDNESDAY, NOVEMBER 3, 1993

Wednesday Session 1a – chair D. Eppstein

- 9:00** *An On-Line Algorithm for Improving Performance in Navigation*
Avrim Blum, Prasad Chalasani
- 9:25** *On the Value of Information in Coordination Games*
Sandra Irani, Yuval Rabani
- 9:50** *Heat & Dump: Randomized Competitive Distributed Paging*
Baruch Awerbuch, Yair Bartal, Amos Fiat
- 10:15** *Throughput-Competitive Online Routing*
Baruch Awerbuch, Yossi Azar, Serge Plotkin

Wednesday Session 1b – chair R. Fagin

- 9:00** *NP Trees and Carnap's Modal Logic*
Georg Gottlob
- 9:25** *Logical Reducibility and Monadic NP*
Stavros S. Cosmadakis
- 9:50** *Gates Accept Concurrent Behavior*
Vineet Gupta, Vaughan Pratt
- 10:15** *Parallel Computable Higher Type Functionals*
Peter Clote, A. Ignjatović, B. Kapron
- 10:35 Break**

Wednesday Session 2a – chair R. Kosaraju

- 10:55** *Random Sampling in Matroids, with Applications to Graph Connectivity and Minimum Spanning Trees*
David R. Karger
- 11:20** *Simulated Annealing for Graph Bisection*
Mark Jerrum, Gregory B. Sorkin
- 11:45** *Using Learning and Difficulty of Prediction to Decrease Computation: A Fast Sort and Priority Queue on Entropy Bounded Inputs*
Shenfeng Chen, John H. Reif

Wednesday Session 2b – chair S. Mahaney

- 10:55** *The Shrinkage Exponent is 2*
Johan Hastad
- 11:20** *Top-Down Lower Bounds for Depth 3 Circuits*
J. Håstad, S. Jukna, P. Pudlák

11:45 *On Representations by Low-Degree Polynomials*
R. Smolensky

12:30 Lunch

Wednesday Session 3a – chair R. Kosaraju

2:15 *A Polynomial-Time Algorithm for the Phylogeny Problem when the Number of Character States is Fixed*

Richa Agarwala, David Fernández-Baca

2:40 *Genome Rearrangements and Sorting by Reversals*

Vineet Bafna, Pavel A. Pevzner

3:05 *Approximating Shortest Superstrings*

Shang-Hua Teng, Frances Yao

Wednesday Session 3b – chair S. Safra

2:15 *On the “log rank”-Conjecture in Communication Complexity*

Ran Raz, Boris Spieker

2:40 *The Complexity and Distribution of Hard Problems*

David W. Juedes, Jack H. Lutz

3:05 *Sensitive Functions and Approximate Problems*

Shiva Chaudhuri

3:35 Break

Wednesday Session 4a – chair O. Waarts

4:00 *Synchronization Power Depends on the Register Size*

Yehuda Afek, Gideon Stupp

4:25 *A Tight Lower Bound for k -Set Agreement*

Soma Chaudhuri, Maurice Herlihy, Nancy A. Lynch, Mark R. Tuttle

Wednesday Session 4b – chair P. Raghavan

4:00 *Space Bounds for Graph Connectivity Problems on Node-Named JAGs and Node-Ordered JAGs*

C. K. Poon

4:25 *Time-Space Lower Bounds for Directed ST-Connectivity on JAG Models*

Greg Barnes, Jeff. A Edmonds

4:50 *A Randomized Time-Space Tradeoff of $O(mR)$ for USTCON*

Uriel Feige

5:10 End of technical sessions

9:00 Business Meeting

THURSDAY, NOVEMBER 4, 1993

Thursday Session 1a – chair N. Megiddo

9:00 *Optimally fast parallel algorithms for preprocessing and pattern matching in one and two dimensions*

Richard Cole, Maxime Crochemore, Zvi Galil, Leszek Gasieniec, Ramesh Hariharan, S. Muthukrishnan, Kunsoo Park, Wojciech Rytter

9:25 *Breaking the $\Theta(n \log^2 n)$ Barrier for Sorting with Faults*

Tom Leighton, Yuan Ma

9:50 *An Linear-Processor Polylog Time Algorithm for Shortest Paths in Planar Graphs*

Philip N. Klein, Sairam Subramanian

10:15 *Highly Efficient Asynchronous Execution of Large-Grained Parallel Programs*

Y. Aumann, Z. M. Kedem, K. V. Palem, M. O. Rabin

Thursday Session 1b – chair M. Kearns

9:00 *General Bounds on Statistical Query Learning and PAC Learning with Noise via Hypothesis Boosting*

Javed A. Aslam, Scott E. Decatur

9:25 *Scale-Sensitive Dimensions, Uniform Convergence, and Learnability*

Noga Alon, Shai Ben-David, Nicolò Cesa-Bianchi, David Haussler

9:50 *Exact Learning via the Monotone Theory*

Nader H. Bshouty

10:15 *Learning an Intersection of k Halfspaces Over a Uniform Distribution*

Avrim Blum, Ravi Kannan

10:35 Break

Thursday Session 2a – chair M. Karchmer

10:55 *Primal-Dual RNC Approximation Algorithms for (Multi)-Set (Multi)-Cover and Non-Negative Integer Programs*

Sridhar Rajagopalan, Vijay V. Vazirani

11:20 *Optimal Parallel All-Nearest-Neighbors Using the Well-Separated Pair Decomposition*
Paul B. Callahan

11:45 *Universal Emulations with Sublogarithmic Slow-down*
Christos Kaklamanis, Danny Krizanc, Satish Rao

Thursday Session 2b – chair U. Vazirani

10:55 *Quantum Circuit Complexity*
Andrew Chi-Chih Yao

11:20 *A Quantum Bit Commitment Scheme Provably Unbreakable by both Parties*
Gilles Brassard, Claude Crépeau, Richard Jozsa

11:45 *Solving Systems of Set Constraints with Negated Subset Relationships*
Rémi Gilleron, Sophie Tison, Marc Tommasi

12:30 Lunch

Thursday Session 3a – chair E. Welzl

2:15 *Near-Quadratic Bounds for the Motion Planning Problem for a Polygon in a Polygonal Environment*
Dan Halperin, Micha Sharir

2:40 *Geometric Discrepancy Revisited*
Bernard Chazelle

3:05 *Product Range Spaces, Sensitive Sampling, and Derandomization*
Hervé Brönnimann, Bernard Chazelle, Jiří Matoušek

Thursday Session 3b – chair D. Kozen

2:15 *The Complexity of the Theory of p -adic Numbers*
Lavinia Egidi

2:40 *Testing Equalities of Multiplicative Representations in Polynomial Time*
Guoqiang Ge

3:05 *Las Vegas Algorithms for Matrix Groups*
Robert Beals, László Babai

3:35 Break

Thursday Session 4a – chair N. Megiddo

4:00 *Faster Algorithms for the Generalized Network Flow Problem*
Tomasz Radzik

4:25 *A Framework for Cost-Scaling Algorithms for Submodular Flow Problems*
Harold N. Gabow

4:50 *A Simple Approximation Algorithm for Multi-commodity Flow, with Applications to On-Line Packet Routing in Distributed Networks*
Baruch Awerbuch, Tom Leighton

Thursday Session 4b – chair M. Karchmer

4:00 *Dynamic Word Problems*
Gudmund Skovbjerg Frandsen, Peter Bro Miltersen, Sven Skyum

4:25 *Optimal Bi-Weighted Binary Trees and the Complexity of Maintaining Partial Sums*
Hari Priyan Hampapuram, Michael L. Fredman

4:50 *A Weak Version of the Blum, Shub & Smale Model*
Pascal Koiran

5:10 **End of technical sessions**

7:30 **Banquet – Garden Court, 520 Cowper St**

FRIDAY, NOVEMBER 5, 1993

Friday Session 1a – chair E. Welzl

9:00 *Almost Tight Upper Bounds for Lower Envelopes in Higher Dimensions*
Micha Sharir

9:25 *On Computing Euclidean Shortest Paths in the Plane*
John Hershberger, Subhash Suri

9:50 *The Union of Convex Polyhedra in Three Dimensions*
Boris Aronov, Micha Sharir

10:15 *Better Lower Bounds on Detecting Affine and Spherical Degeneracies*
Jeff Erickson, Raimund Seidel

Friday Session 1b - chair S. Safra

9:00 *The Hardness of Approximating Problem Defined by Linear Constraints*
Sanjeev Arora, Laszlo Babai, Jacques Stern, Z. Sweedyk

9:25 *When can we sort in $o(n \log n)$ time?*
Amir M. Ben-Amram, Zvi Galil

9:50 *On Bounded Queries and Approximation*

Richard Chang, William I. Gasarch

10:15 *The NC Equivalence of Integer Linear Programming and Euclidean GCD*

David Shallcross, Victor Pan, Yu Lin-Kriz

10:35 Break

Friday Session 2a – chair D. Eppstein

10:55 *A Polynomial Time Algorithm for Counting Integral Points in Polyhedra when the Dimension is Fixed*

Alexander I. Barvinok

11:20 *A Compact Piecewise-Linear Voronoi Diagram for Convex Sites in the Plane*

Michael Mcallister, David Kirkpatrick, Jack Snoeyink

11:45 *Refining a Triangulation of a Planar Straight-Line Graph to Eliminate Large Angles*

Scott A. Mitchell

Friday Session 2b – chair U. Vazirani

10:55 *Signal Propagation, with Application to a Lower Bound on the Depth of Noisy Formulas*

William Evans, Leonard J. Schulman

11:20 *Directed vs. Undirected Monotone Contact Networks for Threshold Functions*

Magnús Halldórsson, Jaikumar Radhakrishnan, K. V. Subrahmanyam

12:30 Lunch

Friday Session 3a – chair D. Kozen

2:15 *Counting Rational Points on Curves over Finite Fields*

Ming-Deh Huang, Doug Ierardi

2:40 *An $O(n \log^3 n)$ Algorithm for the Real Root Problem with Application to the Symmetric Eigenvalue Problem*

John H. Reif

Friday Session 3b – chair O. Waarts

2:15 *Near-Linear Cost Constructions of Neighborhood Covers in Sequential and Distributed Environments and Their Applications*

Baruch Awerbuch, Bonnie Berger, Lenore Cowen, David Peleg

2:40 *Fast Algorithms for Constructing t -Spanners and Paths with Stretch t*

Edith Cohen

3:05 *A Sub-Linear Time Distributed Algorithm for Minimum-Weight Spanning Trees*

Juan A. Garay, Shay Kutten, David Peleg

3:35 Break

Friday Session 4a – chair M. Kearns

4:00 *Eavesdropping Games: A Graph-Theoretic Approach to Privacy in Distributed Systems*

Matthew Franklin, Zvi Galil, Moti Yung

4:25 *A Chernoff Bound for Random Walks on Expander Graphs*

David Gillman

4:50 *On Choosing a Dense Subgraph*

Guy Kortsarz, David Peleg

Friday Session 4b – chair R. Motwani

4:00 *Efficient Out-of-Core Algorithms for Linear Relaxation Using Blocking Covers*

Charles E. Leiserson, Satish Rao, Sivan Toledo

4:25 *External-Memory Computational Geometry*

Michael T. Goodrich, Jyh-Jong Tsay, Darren E. Vengroff, Jeffrey Scott Vitter

5:10 End of program

General Information

Location: All conference events, except the banquet, will take place at the Holiday Inn, Palo Alto, California. Palo Alto is located about 30 miles southeast of San Francisco, and 20 miles northwest of San Jose. Both cities have major airports – pick whichever has more convenient connections. Stanford University is about half mile away from the hotel. The hotel is in downtown Palo Alto, close to shopping, cafes, and restaurants. If you don't plan to travel outside Palo Alto, there is little need for a rental car.

Registration: The registration desk will be open from 7:00PM until 10:00PM on Tuesday, November 2, and during the day on Wednesday through Friday.

Accommodations: A block of rooms has been reserved at the Holiday Inn at favorable rates, but reservations must be received by the hotel by October 12. The hotel provides free parking, complimentary morning coffee, daily newspaper, local shuttle service, non-smoking

rooms, an exercise room, an outdoor pool, etc. Call them if you have any special needs.

Transportation: San Francisco airport is served by Sam-Trans buses (line 7F). From 6am to 1am buses come about every 30 minutes. The trip to Palo Alto takes some 45 minutes and costs 85 cents. (Exact change required, or just pay 1\$.) From the bus stop (at Stanford Shopping Center) there is a 10 minutes walk to the hotel. For door-to-door service the *Airport Connection* (415-363-1500 or 800-AIRPORT) provides shared shuttles from SF airport; The *Express Shuttle* (415-343-6961) serves both the SF and SJ airports. Cost is \$15 from either airport. There are discounts for several people traveling together, and extra charges if you want to travel alone. It is best to reserve a place 24 hours in advance, but not absolutely necessary. In any case, you need to call them when you arrive, to be directed to the pick-up spot. Super Shuttle (415-558-8500, SF only) charges \$23 for the first passenger, and \$7 for each additional one. No reservations needed from the airport. A cab is about \$45 from SF airport, somewhat less from SJ.

United Airlines is offering a special discount for FOCS attendees: 5% off any published United or United Express rate in US, subject to all applicable restrictions, or 10% off M class fares purchased 7 days in advance. Call the United Meeting Center for reservations and more information at 800-521-4041 and refer to ID number 535EX. The United Meeting Center also offers a special rate on Hertz car rentals.

If you drive from either airport, get on US 101 towards Palo Alto (North from SJ, South from SF) Exit at Oregon Expressway/Embarcadero Road. Follow arrows carefully. Take Embarcadero Road West towards Palo Alto and Stanford University. Go straight on Embarcadero about 1.5 miles up to El Camino Real (CA 82), a major intersection. Turn right on El Camino; stay in the right lane. The hotel is about 1/5 mile away, before an overpass, on the right side, as a three lane right exit forms, at 625 El Camino Real.

Climate: The weather in Palo Alto at the beginning of November is usually very pleasant. Day heights are around 70 degrees, night lows are around 45; Bring both a jacket and a swimming suit - the hotel has a pool. The likelihood of rain is under 10%, but bring an umbrella just in case. (San Francisco is somewhat colder and *feels* much colder. If you go to the City, take a windbreaker along, no matter how warm is in Palo Alto.)

Things To Do: Palo Alto is a university and high tech town. There are many interesting bookstores, cafes, restaurants, and shops, many within walking distance from the hotel. Go to a cafe, order a double low-fat de-

caff latte, and check the free Palo Alto Weekly for current events. Some nearby places to visit: Stanford University (daily tours), the SLAC Linear Accelerator, US Geological Survey, etc. Farther away, you can take the train to San Francisco (about 1 hour away, the station is near the hotel), or, if you have a car, visit the Monterey Peninsula, Carmel, etc. Palo Alto is one of the best 10 cities in US for biking, according to a national bike magazine. You might try to explore the area by bike - there are bike lanes all over the town and some challenging terrain nearby. You can rent road and mountain bikes, from *The Bike Connection* (415-424-8034) or *Action Sports* (415-328-3180). Or rent rollerblades from Pacific Mountaineer (415-324-9009) or Palo Alto Sport Shop (415-328-8555). All are walking distance from the hotel. There will be more information about everything at registration or you can email Andrei Broder for help.

Conference Events: A reception will be held at the Holiday Inn from 8PM until 11PM on Tuesday, November 2. Drinks and hors d'oeuvres will be served. There will be a business meeting on Wednesday, November 3, at the Holiday Inn, refreshments will be served. The banquet will be held at the Garden Court Hotel, 520 Cowper St, a short walk away. Lunches will be served in the conference hotel Wednesday, Thursday, and Friday.

Proceedings: Additional copies of the proceedings will be sold during the conference at the registration desk.

Machtley Award: The Machtley Award is presented for the most outstanding paper (or papers) 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 Symposium. Please consider making a donation (\$5 suggested) to the Machtley Award Fund so that this award tradition can be sustained. Use a separate check.

Local Arrangements Chair: Andrei Broder, DEC Systems Research Center, 130 Lytton Avenue, Palo Alto, CA 94301. Phone: 415-853-2118. Fax: 415-853-2104. E-mail:

Technical Committee Chair: Allan Borodin, Department of Computer Science, University of Toronto, Toronto, Ontario M5S 1A4, CANADA

Program Committee Chair: Leonidas Guibas, Computer Science Department, Stanford University, Stanford, CA 94305.

Program Committee: Richard Anderson, David Eppstein, Ronald Fagin, Leonidas Guibas, Mauricio Karchmer, Michael Kearns, Rao Kosaraju, Dexter Kozen, Stephen Mahaney, Nimrod Megiddo, Rajeev Motwani, Prabhakar Raghavan, Shmuel Safra, Umesh Vazirani, Orli Waarts, and Emo Welzl.