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Joshua Brody

Research Interests

Communication complexity, algorithms, theory of computation, upper and lower bounds.

Education

Dartmouth College, Hanover, NH

Candidate for Ph.D. in Computer Science

Advisor: Amit Chakrabarti

Research Area: Communication Complexity

September 2005-present

New York University, New York, NY

Master of Science in Computer Science

GPA: 3.97/4.0

September 2003-May 2005

Carnegie Mellon University, Pittsburgh, PA

Bachelor of Science in Mathematics/Computer Science

GPA: 3.32/4.0

September 1993-December 1997

Publications

- J. Brody and A. Chakrabarti. “A Multi-Round Communication Lower Bound for Gap Hamming and Some Consequences.” *24th Annual IEEE Conference on Computational Complexity (CCC 2009)*, July, 2009.
 - J. Brody. “The Maximum Communication Complexity of Multiparty Pointer Jumping.” *24th Annual IEEE Conference on Computational Complexity (CCC 2009)*, July, 2009.
 - C. Arackaparambil, J. Brody, and A. Chakrabarti. “Functional Monitoring Without Monotonicity.” *36th International Colloquium on Automata, Languages, and Programming (ICALP 2009)*, July, 2009.
 - S. Bratus, J. Brody, D. Kotz, and A. Shubina. “Streaming Estimation of Information-theoretic Metrics for Anomaly Detection.” *11th International Symposium on Recent Advances in Intrusion Detection (RAID 2008)*, September 2008.
 - J. Brody and A. Chakrabarti. “Sublinear Communication Protocols for Multi-Party Pointer Jumping and a Related Lower Bound.” *25th International Symposium on Theoretical Aspects of Computer Science (STACS 2008)*, February, 2008.
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Experience

Research:

Dartmouth College, Hanover, NH. *Research Assistant*

June 2006-present

- Analyzed the randomized communication complexity of the Gap Hamming Distance problem. Achieved breakthrough linear lower bound for any randomized, constant-round protocol, with major implications to streaming algorithms. Results published in CCC 2009.
- Examined distributed functional monitoring problems. Discovered new upper and lower bounds for monitoring frequency moments. Engineered a nontrivial algorithm for monitoring Shannon Entropy. This is the first algorithm for monitoring a non-monotonic function. Results published in ICALP 2009.

- Investigated information-theoretic lower bounds for communication complexity. Discovered first nontrivial upper bound for the multiparty pointer jumping problem. Introduced novel lower bound techniques. Results published in STACS 2008 and CCC 2009.

New York University, New York, NY. *Research Assistant*

June 2004-July 2004

- Explored greatest common divisor algorithms for different Euclidean domains under Victor Shoup.

Teaching:

Dartmouth College, Hanover, NH. *Teaching Assistant*

September 2005-June 2006

- Introduction to Computer Science (CS 5): Fall 2005, Spring 2006. Substituted as lecturer. Held regular office hours for students. Supervised weekly lab hours.
- Concepts in Computing (CS 4): Winter 2006. Held regular office hours for students. Supervised weekly lab hours.

New York University, New York, NY. *Grader*

January 2005 - June 2005

- Introduction to Cryptography (V22.0478): Spring 2005

Lycée Provincial de Yako, Yako, Burkina Faso. *Peace Corps Volunteer*

June 2000 - September 2002

- Instructed junior/senior high school mathematics in French to classes averaging 80 students (500+ students total). Designed lesson plans and tests.
- Taught basic computer skills including typing, email, and Microsoft Office applications to school administrators, teachers, and staff. Blueprinted curriculum and lesson plans.
- Trained 25 incoming Peace Corps Volunteers how to teach and manage a Burkinabè classroom.

Carnegie Mellon University, Pittsburgh, PA. *Teaching Assistant*

September 1995-December 1995

- Differential and Integral Calculus (21-120): Fall 1995. Administered recitations and graded homework and tests for introductory calculus course.

Professional:

Encoda Systems, New York, NY. *Software Developer*

June 2003 - February 2004

- Designed and conceived a data abstraction layer (DAL) between legacy ISAM database and C-level data structures. Our solution encapsulated low-level C and assembly code, allowing application developers to concentrate on business-level code and enabling Encoda to develop a relational database scheme without interrupting application development.
- Upgraded and enhanced Encoda's broadcast management software.

Lockheed Martin ATL, Camden, NJ. *Software Developer*

June 1998 - April 2000

- Managed configuration and architected version control and testing procedures for "Listen, Communicate, Show" (LCS), a multi-platform, distributed speech technology project with applications in military logistics and civilian airline reservation systems.
- Redesigned Java user interface, interfacing with GALAXY Communicator speech technology architecture.

6DOS, Inc., Pittsburgh, PA. *Software Developer*

October 1996 - April 1998

- Planned and realized 6DOS information system, a three-tier Internet/Intranet knowledge management application. Produced Web and email user interfaces in C++ on Solaris, using CGI with Apache web server.
- Constructed CORBA client/server interface in Java.

Invited Talks

- Centrum Wiskunde & Informatica (CWI), Amsterdam, Netherlands. Lower Bounds for Gap-Hamming-Distance and Consequences for Data Stream Algorithms. July 2009.
- Tel Aviv University Theory of Computation Seminar, Tel Aviv, Israel. A Multi-Round Communication Lower Bound for the Gap Hamming Problem. June 2009.
- Northeastern University Theory of Computation Seminar, Boston, MA. Some Applications of Communication Complexity. February 2009.

Scientific Visits

- Centrum Wiskunde & Informatica (CWI), June-July 2009.
- Tel Aviv University, June 2009.

Professional Activities

Referee for the following journals and conferences: Theory of Computing (2008), FOCS 2009, CCC 2009, CCC 2008.
Working group member, IEEE Standard 1517: Reuse Processes (2009)
Dartmouth Computer Science Research Symposium (CSRS), *Program Committee* (2007)
Dartmouth Computer Science Research Symposium (CSRS), *Cofounder, Program Committee* (2006)

Technical Skills

Programming Languages: C/C++ (4 years), Java (4 years), HTML (2 years), Javascript (2 years)
Operating Systems: Linux/Unix (10 years), Windows NT/XP (6 years)

Personal

American citizen. Native speaker of English, proficient in French. Hobbies include bagpiping, German board games, ice hockey, and squash.

References

References available upon request.