

# Paul Cuff

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## Education

- **Stanford University** Stanford, CA  
*Ph.D. in Electrical Engineering* 2004 - 2009
  - Advisor: Prof. Thomas Cover.
  - Dissertation title: “Communication in Networks for Coordinating Behavior.”
  - Ph.D Qualification Exam Ranking: 1/148 — GPA: 4.0+
- **Brigham Young University** Provo, UT  
*B.S. in Electrical Engineering* 1998 - 2004
  - Research: Speech Processing to enhance low quality audio recordings. (Prof. David Long)
  - Major GPA: 4.0 — General GPA: 3.93
  - Tau Beta Pi

## Professional Experience

- **Princeton University - Electrical Engineering Department** Princeton, NJ  
*Assistant Professor* 2009-present
- **Microsoft Research** Redmond, WA  
*Intern - Theory Group* Summer 2008
  - Analyzed the mixing time of the Glauber dynamics for the Potts model (statistical physics).
  - Consulted for SongSmith, which automatically generates accompaniment for a melody.
- **Google** Mountain View, CA  
*Intern - Decision Support - Search Quality Analyst* Summer 2007
  - Collected and Analyzed Internet-search market-share data.
- **Nuova Systems** Santa Clara, CA  
*Intern—Network Algorithms Research* Spring 2006
  - Modified and simulated the *backward congestion notification* algorithm to avoid congestion in high-speed networks with small buffers.
- **Adaptive Hearing Solutions** Palo Alto, CA  
*Co-Founder with Prof. Bernard Widrow* 2005
  - Co-designed a real-time speech denoising adaptive filter for hearing aids.
  - Implemented the filter in software.
  - Obtained funding: pitched the idea and demonstrated the technology to investors.
  - Conducted experimental test of quality with the Stanford Audiology Clinic.
- **L-3 Communications** Salt Lake City, UT  
*Intern - Advanced Communications Group* Summer 2004
  - Simulated communication modems and error-correction codes using C++.
- **Electro Scientific Industries** Portland, OR  
*Intern - Circuit Design* Summer 2002
  - Designed and prototyped power amplifiers for precision control circuits.

## Awards

- **ISIT Best Student Paper Award** 2008
- **National Defense Science and Engineering Graduate Fellowship** 2005 - 2008
- **Numerical Technologies Fellowship** 2005
- **Outstanding Teaching Assistant (Stanford IEEE-WIE)** 2005
- **Stanford BASIS Entrepreneurial Challenge: 1st Place** 2005
- **Micron Scholarship** 2002 - 2004
- **Dean's List** 2001 - 2004
- **Academic Full Scholarship** 1998 - 2002

## Research

- **Coordinated Behavior:** [J3], [J4], [C1], [C4], [T1], [T2], [T4], [T5] 2008 - 2009
- **Source Coding:** [J2], [C2], [C3] 2006 - 2008
- **Statistical Physics — Markov Chain Mixing Time:** [J5] 2008
- **Channel Capacity:** [J1], [C5], [C6], [T3], [T6] 2006 - 2007
- **Network Congestion Control** 2005 - 2006
- **Speech Processing** 2002 - 2005

## Teaching

- **Graduate Course in Statistical Signal Processing (EE 278)** Summer 2009  
*Stanford University*
  - Taught this course at department request during last term of Ph.D.
- **Teaching Assistant**  
*Stanford University*
  - Information Theory (Prof. Cover)
  - Signal Processing and Linear Systems I and II (**TA Award**) — taught five lectures.
  - Introduction to Electronics
- **Tutor**  
*Undergrad Level*
  - Probability Theory
  - Physics

## Academic Community Involvement

- Member of Technical Program Committee, IEEE Information Theory Workshop (ITW), Cairo, 2010.

### Dissertation

- P. Cuff, “Communication in Networks for Coordinating Behavior.” Ph.D. dissertation, Stanford University, August, 2009.

### Journal Publications

#### Published:

- [J1] H. Permuter, P. Cuff, B. Van Roy, and T. Weissman, “Capacity of the Trapdoor Channel with Feedback,” *IEEE Trans. Info. Theory*, 54(7):3150-65, July, 2008.

#### Submitted or In Preparation:

- [J2] J. Wang, J. Chen, L. Zhao, P. Cuff, H. Permuter, “A Random Variable Substitution Lemma with Applications to Multiple Description Coding,” submitted to *IEEE Trans. Info. Theory*, September, 2009, available at <http://arxiv.org/abs/0909.3135>.
- [J3] P. Cuff, H. Permuter, T. Cover, “Coordination Capacity,” submitted to *IEEE Trans. Info. Theory*, August, 2009, available at <http://arxiv.org/abs/0909.2408>.
- [J4] P. Cuff, “Communication Requirements for Generating Correlated Random Variables,” in preparation.
- [J5] P. Cuff, J. Ding, O. Luidor, E. Lubetzky, Y. Peres, A. Sly, “Mixing Time Analysis of the Glauber Dynamics for the Q-state Potts Model on the Complete Graph,” in preparation.

### Conference Publications

- [C1] P. Cuff, “State Information in Bayesian Games,” invited and presented at *Allerton Conference on Communication, Control, and Computing*, October, 2009, published at <http://arxiv.org/abs/0911.0874>.
- [C2] P. Cuff, H.-I Su, A. El Gamal, “Cascade Multiterminal Source Coding,” *Proc. IEEE Int. Symp. Info. Theory*, Seoul, S. Korea, July, 2009.
- [C3] L. Zhao, P. Cuff, H. Permuter, “Consolidating Achievable Regions for Multiple Descriptions,” *Proc. IEEE Int. Symp. Info. Theory*, Seoul, S. Korea, July, 2009.
- [C4] P. Cuff, “Communication Requirements for Generating Correlated Random Variables,” *Proc. IEEE Int. Symp. Info. Theory*, Toronto, Canada, July, 2008 (**Best Student Paper Award**).
- [C5] H. Permuter, P. Cuff, B. Van Roy, and T. Weissman, “Capacity and Zero-Error Capacity of the Chemical Channel with Feedback,” *Proc. IEEE Int. Symp. Info. Theory*, Nice, France, June, 2007.
- [C6] H. Permuter, P. Cuff, B. Van Roy, and T. Weissman, “Capacity of the Trapdoor Channel with Feedback,” *Allerton Conference*, Sept., 2006.

### Additional Talks

- [T1] “Efficient Communication for Control in Games and Networks,” Information Sciences and Systems Seminar, Princeton, Oct., 2009.
- [T2] “Investigating the Fundamental Communication Burden of Cooperation,” Information Theory and Applications Workshop, Feb., 2009.
- [T3] “The Golden Ratio in Communication—Blackwell’s Trapdoor Channel and Task Assignment,” Laboratory for Information and Decision Systems at MIT, Nov., 2008 (Organized by Prof. Lizhong Zheng).
- [T4] (Invited Talk) “Coordination via Communication,” *Allerton Conference*, Sept., 2008.
- [T5] “Coordination via Communication,” *School of Information Theory*, Penn. State University, May, 2008.
- [T6] “Entropy Rates of Hidden Markov Processes emerge from Blackwell’s Trapdoor Channel,” *BIRS Workshop on Entropy Rate of Hidden Markov Processes and Connections to Dynamical Systems*, Oct., 2007.

## Personal Details

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## Interests and Adventures

- Minor League Football — Golden Coast Football League — Wide Receiver 2006 - 2008
- International Folk Dance Team — Brigham Young University 2003 - 2004
- Japanese — Two years as volunteer missionary in Japan 1999 - 2001
- Wrestling Intramural Champion 1999
- Jazz Band — Alto Saxophone 1994 - 1998
- Eagle Scout 1993 - 1998

## Collaborators

J. Chen (McMaster), T. Cover (Stanford), J. Ding (UC Berkeley), A. El Gamal (Stanford), O. Luidor (NYU), E. Lubetzky (Microsoft Research), Y. Peres (Microsoft Research), H. Permuter (Ben-Gurion), A. Sly (Microsoft Research), H.-I Su (Stanford), B. Van Roy (Stanford), J. Wang (Shanghai Jiao Tong), T. Weissman (Stanford), L. Zhao (Stanford).

## Ph.D. Advisors

- Advisor: Thomas Cover (Stanford)
- Co-advisor: Tsachy Weissman (Stanford)