

# David Teh-Hwa Kao

University of Southern California  
Ming Hsieh Department of Electrical Engineering

University of Southern California  
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## Professional Interests

network information theory, distributed networks & protocols, interference management, cooperative network structure, resource allocation, fairness & network utility maximization

## Education

Ph.D.	Electrical Engineering	Rice University	May 2012
	Thesis : <i>A Matter of Perspective: Reliable Communication and Coping with Interference with Only Local Views</i>		
	Advisor: Dr. Ashutosh Sabharwal		
M.S.	Electrical Engineering	Rice University	May 2008
	Thesis : <i>On Fairness in Wireless Networks Under Channel Uncertainty</i>		
	Advisor: Dr. Ashutosh Sabharwal		
B.S.	Electrical Engineering (with honors)	Univ of Illinois – Urbana-Champaign	May 2006
	Thesis : <i>Block-Constant Modulus Signaling</i>		

## Positions

Postdoc. Researcher	Univ Southern California – EE Department	2014–Present
	<i>Network information theory research.</i>	
Postdoc. Res. Assoc.	Cornell Univ – ECE Department	2013–2014
	<i>Network information theory research.</i>	
Visiting Researcher	Rice Univ – ECE Department (CMC Lab)	2012
	<i>Wireless networks &amp; network information theory research.</i>	
Research Assistant	Rice Univ – ECE Department (CMC Lab)	2006–2012
	<i>Studied wireless networks: major themes include the impact of incomplete &amp; distributed knowledge on network-optimal resource allocation and the impact of network infrastructure design on interference networks. Assisted in preparation of grant proposals. Assisted in administration of and graded and lead help sessions for courses (Signals &amp; Systems, Digital Communications, Wireless Communications).</i>	
Visiting Researcher	Arizona State Univ – School of Arts, Media & Engineering	2010
	<i>Studied impact of communication network infrastructure on spread of information in social networks.</i>	
Visiting Researcher	Princeton Univ – EE Department	2008
	<i>Studied and developed axiomatic interpretation of fairness measures: this axiomatic system generalizes many quantitative notions of fairness and social optimality in engineering, economics, social sciences and philosophy, thereby clarifying themes prevalent across disciplines and leading to many new insights.</i>	
Engineering Intern	Motorola Customer's Center for Solutions Integration	2006
	<i>Design, staging, integration, and testing of large scale two-way trunking radio systems.</i>	

Vodafone Scholar	Univ of Illinois – Coordinated Science Lab <i>Research on fading-resistant block-signaling methods — designed and evaluated low complexity signaling scheme resistant to effects of low quality channel estimation and/or AGC for slow-fading channels. Scheme was predicated on the concept of a block-constant modulus.</i>	2005–2006
Grader	Univ of Illinois – ECE Department <i>Proctored and graded exams, held weekly sessions to supplement lecture for class of 250 students.</i>	2004–2006
Research Assistant	Univ of Illinois – Bioacoustic Research Lab <i>Studied effects of ultrasonic stimuli at liquid/gas boundaries. Characterized and calibrated transducers and experiment apparatuses, performed experiments, and wrote scripts to process experiment data.</i>	2003–2004

## Honors & Awards

Edmund McAshan Dupree Distinguished Graduate Fellowship in Electrical Engineering	2008–2009
Texas Instruments Distinguished Endowed Fellowship	2006–2009
Texas Instruments Best Coder for ELEC 541	2008
Alton B. Zerby & Carl T. Koerner Outstanding ECE Student Award Finalist	2007
Vodafone Research Scholarship	2005
University of Illinois Chancellor’s Scholar	2002–2006
University of Illinois Engineering College James Scholar	2002–2006
University of Illinois Dean’s List (7 Semesters)	2002–2006
University of Illinois Elec. & Com. Eng. Outstanding Freshman	2002
National Merit Finalist	2002
Brown University Book Award	2002
Hillsborough High School Valedictorian & Math Award	2002

## Publications

- [1] D. Kao and A. Avestimehr, “Linear degrees of freedom of the MIMO X-channel with delayed CSIT.” submitted to IEEE Transactions on Information Theory.
- [2] D. Kao, M. Maddah-Ali, and A. Avestimehr, “Align-and-forward relaying for two-hop erasure broadcast channels.” to appear in Information Theory Proceedings (ISIT), 2014 IEEE International Symposium on.
- [3] D. Kao and A. Avestimehr, “Linear degrees of freedom of the MIMO X-channel with delayed CSIT.” to appear in Information Theory Proceedings (ISIT), 2014 IEEE International Symposium on.
- [4] D. Kao and A. Sabharwal, “Two-user interference channels with local views: On capacity regions of TDM-dominating policies,” *Information Theory, IEEE Transactions on*, vol. 59, no. 11, pp. 7014–7040, 2013.
- [5] D. T. H. Kao and A. Sabharwal, “How local can a node’s view be and still guarantee sum-capacity in interference networks?.” to appear in *Proc. GlobalSIP 2013*, Dec. 2013. (*invited*).
- [6] D. Kao and A. Sabharwal, “An upper bound on the capacity of vector dirty paper with unknown spin and stretch,” in *Information Theory Proceedings (ISIT), 2013 IEEE International Symposium on*, pp. 281–285, 2013.
- [7] D. T. H. Kao and A. Sabharwal, “Node cooperation with local views in the two-user interference channel.” in *Proc. Asilomar Conference on Signals, Systems and Computers*, Nov. 2012. (*invited*).
- [8] H. Yu, L. Zhong, A. Sabharwal, and D. Kao, “Beamforming on mobile devices: A first study,” in *Proc. ACM Int. Conf. Mobile Computing and Networking (MobiCom)*, 2011.
- [9] T. Lan, D. Kao, M. Chiang, and A. Sabharwal, “An axiomatic theory of fairness in wireless resource allocation,” in *Proc. IEEE INFOCOM Conference*, 2010.

- [10] D. T.-H. Kao and A. Sabharwal, "Impact of network topology knowledge on fairness: A geometric approach," in *Proc. IEEE INFOCOM Mini-Conference*, 2009.

## Posters, Presentations, & Demos

- [1] D. Kao and A. Sabharwal, "On capacity regions of interference channels with mismatched local views." North American School of Information Theory. Cornell University, Ithaca NY, June 2012.
- [2] D. T. H. Kao and A. Sabharwal, "On capacity regions of interference channels with mismatched local views." The Winedale Workshop. Round Top TX, October 2011.
- [3] H. Yu, L. Zhong, A. Sabharwal, and D. Kao, "Beamforming on mobile devices: A first study." MobiCom Demonstration. 2011.
- [4] D. Kao and A. Sabharwal, "Simple approaches can optimize scalable interference networks." ACM S3 Workshop. 2011.
- [5] D. T. H. Kao and A. Sabharwal, "When can a distributed interference network do better than tdma?." NYU-Polytechnic Institute. New York NY, June 2011.
- [6] D. T. H. Kao and A. Sabharwal, "On capacity regions of interference channels with mismatched local views." AT&T Labs. Florham Park NJ, June 2011.
- [7] D. T. H. Kao and A. Sabharwal, "On capacity regions of interference channels with mismatched local views." Rutgers WINLAB. New Brunswick NJ, June 2011.
- [8] D. T. Kao and A. Sabharwal, "Coping with interference in wireless networks with only local views." Princeton EDGE Lab. Princeton NJ, May 2011.
- [9] D. T. Kao and A. Sabharwal, "Impact of network topology knowledge on fairness: A geometric approach." 2nd Annual School of Information Theory. Chicago IL, August 2009.
- [10] D. T. Kao and A. Sabharwal, "Impact of network topology knowledge on fairness: A geometric approach." The Winedale Workshop. Round Top TX, October 2008.
- [11] D. T. Kao and A. Sabharwal, "Distributed spectrum sharing via graph coloring." Communications Theory Workshop. Sedona AZ, May 2007.

## Course Projects

- "Rate-compatible Irregular LDPC code design for HARQ Systems with Rate Limited Feedback"  
ELEC 541 — Fall 2008, with Debashis Dash **TI Best Coders (best class project)**
- "Cooperation-Enabled Virtual MIMO for High-Throughput Cellular Downlink"  
ELEC 433 — Fall 2008, with Michael Wu
- "On Distributed Optimization in Wireless Networks: Utility Definition and Information Sharing"  
ELEC 537 — Fall 2007, with Gareth Middleton

## Skills

**Operating Systems :** Linux/Unix, Windows

**Programming :** Assembly, C/C++, Java, MySQL, Perl, PHP, Python, Tcl, VHDL

**Software :** L<sup>A</sup>T<sub>E</sub>X, Matlab, Mentor Graphics, NS2, PSPICE, Simulink, System Generator

**Prototyping/Development Platforms :** WARP

**Languages :** Professional proficiency in spoken/written German, spoken Chinese (Mandarin)

## **Extracurricular Activities**

Brown School of Engineering, Rice University:

Presentation Coach 2009–2012

ECE Department, Rice University:

Mentor for First-year Graduate Students 2009–2010

Graduate Student Recruitment Coordinator 2007–2009

Eta Kappa Nu (Electrical and Computer Engineering Honor Society):

Alpha Chapter President 2005–2006

(Outstanding Chapter Award) 2006, 2007

Centennial Conference Programming Committee 2004

Tau Beta Pi (Engineering Honor Society)

Institute of Electrical and Electronics Engineers (IEEE):

Member of Communications Society & Information Theory Society

Committed Runner and Triathlete (10+ Marathons, Ironman Triathlon)