

David N.C. Tse

Curriculum Vitae

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Research interests: Wireless communications, information theory, networking.

Education:

- M.S. (1991), Ph.D. (1994) in electrical engineering, Massachusetts Institute of Technology, Cambridge, MA.
- B.A.Sc. (1989) in systems design engineering, University of Waterloo, Canada.

Positions Held:

- Professor, Dept. of EECS, U.C. Berkeley, July, 2002 - present.
- Associate Professor, Dept. of EECS, U.C. Berkeley, July, 2000 - June 2002.
- Assistant Professor, Dept. of EECS, U.C. Berkeley, Nov. 1995 - June 2000.
- Industrial leave, Qualcomm Inc., San Diego, Jan.-May, 1999.
- postdoctoral member of technical staff, A.T. & T. Bell Laboratories, Oct. 1994-Oct. 1995.

Awards:

- 2001 IEEE Communications and Information Theory Societies' Joint Paper Award (for [J17]).
- Best Paper Awards in 1998 and 2001 IEEE INFOCOM conferences (for [C31] and [C10]).
- 2000 Erlang Prize from the INFORMS Applied Probability Society for researchers under the age of 35.
- 1998 Early Faculty CAREER Award from National Science Foundation
- Canadian Natural Science and Engineering Research Council 1967 Graduate Fellowship (1989-1993)
- University of Waterloo Alumni Gold Medal for top graduate in engineering school (1989)

Professional Activities:

- Associate Editor, *IEEE Transactions on Information Theory*.
- Guest editor: *IEEE Transactions on Information Theory* special issue on Multi-scale Signal Analysis and its Applications, April 1999; *Automatica* special issue on Control Methods for Communication Networks, December 1999.
- Technical program committee co-chair, 2004 International Symposium on Information Theory.
- Program committee member: 1999 and 2000 INFOCOM conferences, 2000,2001,2002, 2003 International Symposia on Information Theory.
- Session chair: 1997 INFORMS conference, 1997 Asilomar conference, 1999 Information theory workshops in South Africa and in Greece, 2001 International Symposium on Information Theory.

Teaching:

Taught undergraduate and graduate courses in communication networks, digital communications, information theory, random processes and probability.

Publications

Patents

- [P1] "Transmitter directed, multiple receiver system using path diversity to equitably maximize throughput", patent filed, May 24, 1999.
- [P2] "Renegotiated bit-rate service system and method", U.S. Patent #5604731, Feb. 18, 1997.
- [P3] "Data segmentation within a renegotiated bit-rate service transmission system", U.S. Patent #5559798, Sept. 24, 1996.

Journal (In Review)

- [S1] P. Viswanath and D. Tse, "Sum Capacity of the Multiple Antenna Gaussian Broadcast Channel and Uplink-Downlink Duality", submitted to *IEEE Transactions on Information Theory*, July 2002.
- [S2] N. Laneman, D. Tse and G. Wornell, "Cooperative Diversity in Wireless Networks: Efficient Protocols and Outage Behavior", submitted to *IEEE Transactions on Information Theory*, Jan. 2002.
- [S3] M. Grossglauser and D. Tse, "A Time-Scale Decomposition Approach to Measurement-Based Admission Control", conditional accepted for *IEEE/ACM Transactions on Networking*, revised May 2002.
- [S4] A. Poon, D. Tse and R. Brodersen, "An Adaptive Multi-antenna Transceiver for Slowly Flat Fading Channels", submitted to the *IEEE Transactions on Communications*, March 2000.
- [S5] D. Tse, "Optimal Power Allocation over Parallel Gaussian Broadcast Channels", submitted to *IEEE Transactions on Information Theory*, Oct. 1998.

Journal (In Print or In Press)

- [J1] L. Zheng and D. Tse, "Diversity and Multiplexing: A Fundamental Tradeoff in Multiple Antenna Channels" to appear in *IEEE Transactions on Information Theory*, 2002.
- [J2] P. Viswanath, D. Tse and R. Laroia, "Opportunistic Beamforming using Dumb Antennas", *IEEE Transactions on Information Theory*, vol. 48(6), June, 2002.
- [J3] M. Grossglauser and D. Tse, "Mobility Increases the Capacity of Adhoc Wireless Networks", to appear in *IEEE/ACM Transactions on Networking*, August 2002.

- [J4] C. Chuah, D. Tse, J. Kahn and R. Valenzuela, "Capacity Scaling in MIMO Wireless Systems under Correlated Fading", *IEEE Transactions on Information Theory*, vol. 48(3), March 2002, pp. 637-650.
- [J5] L. Zheng and D. Tse, "Communicating on the Grassman Manifold: A Geometric Approach to Noncoherent Multi-antenna Channels", *IEEE Transactions on Information Theory*, vol. 48(2), February 2002, pp. 359-383.
- [J6] S. Hanly and D. Tse, "Resource Pooling and Effective Bandwidths in CDMA Systems with Multiuser Receivers and Spatial Diversity", *IEEE Transactions on Information Theory*, vol. 47(4), May 2001, pp. 1328-1351.
- [J7] J. Zhang, E. Chong and D. Tse, "Output MAI Distributions of Linear MMSE Multiuser Receivers in CDMA Systems", *IEEE Transactions on Information Theory*, vol. 47(3), March 2001, pp. 1128-1144.
- [J8] P. Viswanath, D. Tse and V. Anantharam, "Asymptotically Optimal Waterfilling in Vector Multiple Access Channels", *IEEE Transactions on Information Theory*, vol. 47(1), January 2001, pp. 241-267.
- [J9] D. Tse and S. Verdú, "Optimum Asymptotic Multiuser Efficiency for Randomly Spread CDMA", *IEEE Transactions on Information Theory*, vol. 46(7), November 2000, pp. 2718-2722.
- [J10] J.S. Evans and D. Tse, "Large System Performance of Linear Multiuser Receivers in Multipath Fading Channels", *IEEE Transactions on Information Theory*, vol. 46(6), Sept 2000, pp. 2059-2078.
- [J11] Kiran and D. Tse, "Effective Bandwidths and Effective Interference for Linear Multiuser Receivers in Asynchronous CDMA Systems", *IEEE Transactions on Information Theory*, vol 46(4), July 2000, pp. 1426-1447.
- [J12] E. Telatar and D. Tse, "Capacity and Mutual Information of Wideband Multipath Fading Channels", *IEEE Transactions on Information Theory*, vol 46(4), July 2000, pp. 1384-1400.
- [J13] D. Tse and O. Zeitouni, "Linear Multiuser Receivers in Random Environments", *IEEE Transactions on Information Theory*, vol 46(1), Jan. , 2000, pp. 171-188.
- [J14] S. Hanly and D. Tse, "Power Control and Capacity of Spread-Spectrum Wireless Networks", *Automatica*, vol.35, (no.12), Dec. 1999. p.1987-2012.
- [J15] M. Grossglauser and D. Tse, "A Framework for Robust Measurement-Based Admission Control", *IEEE/ACM Transactions on Networking*, v. 7, No. 3, June 1999, pp. 293-309.
- [J16] P. Viswanath, V. Anantharam and D. Tse, "Optimal Sequences, Power Control and Capacity of Synchronous CDMA Systems with Linear MMSE Multiuser Receivers", *IEEE Transactions on Information Theory*, v. 45(6), Sept., 1999, pp. 1968-1983.

- [J17] D. Tse and S. Hanly, "Linear Multiuser Receivers: Effective Interference, Effective Bandwidth and User Capacity", *IEEE Transactions on Information Theory*, v.45, No. 2, Mar. 1999, pp. 641-657.
- [J18] D. Tse and S. Hanly, "Multi-Access Fading Channels: Part I: Polymatroid Structure, Optimal Resource Allocation and Throughput Capacities", *IEEE Transactions on Information Theory*, v. 44, No. 7, Nov., 1998, pp. 2796-2815.
- [J19] S. Hanly and D. Tse, "Multi-Access Fading Channels: Part II: Delay-Limited Capacities", *IEEE Transactions on Information Theory*, v. 44, No. 7, Nov., 1998, pp. 2816-2831.
- [J20] M. Grossglauser, S. Keshav and D. Tse, "RCBR: A Simple and Efficient Service for Multiple Time-Scale Traffic ", *IEEE/ACM Transactions on Networking*, December 1997, pp. 741-755.
- [J21] A. Elwalid, G. Freundlich, P. Gerhardt, H. Hagirahim, K.G. Ramakrishnan and D. Tse, "An Overview of the Multimedia Communications Exchange (MMCX) and its Performance Characterization", *Bell Laboratories Technical Journal*, vol. 2, no. 2, 1997, pp. 15-30.
- [J22] D. Tse, R.G. Gallager and J.N. Tsitsiklis, "Statistical Multiplexing of Multiple Time-scale Markov Streams", *IEEE Journal on Selected Areas in Communications*, special issue on Advances in the Fundamentals of Networking, vol. 13, no. 6., Aug. 1995, pp. 1028-1039.
- [J23] M.A. Dahleh, E.D. Sontag, D. Tse, J.N. Tsitsiklis, "Worst-Case Identification of Non-linear Fading Memory Systems", *Automatica*, vol.31, no. 3, Mar. 1995, pp. 503-508.
- [J24] S.R. Kulkarni and D. Tse, "A Paradigm for Class Identification Problems", *IEEE Transactions on Information Theory*, vol.40, no.1, May 1994, pp. 696-705.
- [J25] D. Tse, M.A. Dahleh, J.N. Tsitsiklis, "Optimal Asymptotic Identification Under Bounded Disturbances", *IEEE Transactions on Automatic Control*, vol.38, no.8, Aug. 1993, pp. 1176-90.
- [J26] D. Tse and G.R. Heppler, "Shape Determination for Large Flexible Satellites via Stereo Vision", *AIAA Journal of Spacecraft and Rockets*, vol. 29, no. 1, Jan-Feb. 1992.

Conference

- [C1] D. Tse and P. Viswanath, "Uplink-Downlink Duality and Effective Bandwidths", ISIT 2002.
- [C2] P. Viswanath and D. Tse, "Sum Capacity of the Multiple Antenna Broadcast Channel", ISIT 2002.
- [C3] L. Zheng and D. Tse, "Optimal Diversity-multiplexing tradeoff and Error Exponents", ISIT 2002.

- [C4] S. Diggavi, M. Grossglauser and D. Tse, “Even One-Dimensional Mobility Increases Ad-hoc capacity”, ISIT 2002.
- [C5] L. Zheng and D. Tse, “Optimal Diversity-Multiplexing Tradeoff in Multi-Antenna Channels”, Allerton Conference, Oct 2001.
- [C6] N. Laneman, D. Tse and G. Wornell, “An Efficient Protocol for Realizing Cooperative Diversity in Wireless Networks”, ISIT 2001.
- [C7] L. Zheng and D. Tse, “The Noncoherent Block Fading Channel: A Degree of Freedom View”, ISIT 2001.
- [C8] D. Tse, “Multiuser Diversity Through Proportional Fair Scheduling”, Communication Theory Workshop, May 2001.
- [C9] P. Viswanath, D. Tse and R. Laroia, “Opportunistic Beamforming Using Dumb Antennas”, Communication Theory Workshop, May 2001.
- [C10] M. Grossglauser and D. Tse, “Mobility Increases the Capacity of Wireless Adhoc Networks”, Infocom 2001. (This work won the Best Paper Award at the conference.)
- [C11] L. Zheng and D. Tse, “Communicating on the Grassman Manifold: A Geometric Approach to Multi-antenna Fading Channels”, *International Symposium on Information Theory*, Sorrento, Italy, June 2000.
- [C12] P. Viswanath, D. Tse and V. Anantharam, “Asymptotically Optimal Waterfilling in Multiple Antenna Multiple Access Channels”, *International Symposium on Information Theory*, Sorrento, Italy, June 2000.
- [C13] S.V. Hanly and D. Tse, “A Resource Pooling Result for a CDMA Antenna Array”, *International Symposium on Information Theory*, Sorrento, Italy, June 2000.
- [C14] J. Zhang, E. Chong and D. Tse, “Distributions of the Output MAI of Linear MMSE Multiuser Receivers in CDMA Systems”, *International Symposium on Information Theory*, Sorrento, Italy, June 2000.
- [C15] L. Zheng and D. Tse, “Packing Spheres into the Grassman Manifold: A Geometric Approach to Multi-antenna Fading Channels”, *Proc. of Allerton Conference*, Monticello, IL, Sept 1999.
- [C16] D. Tse, “Multiuser Receivers, Random Matrices and Free Probability”, *Proc. of Allerton Conference*, Monticello, IL, Sept 1999.
- [C17] P. Ho, D. Tse and J. Walrand, “Stability of Multilane Input-Buffered Switches with Markov Modulated Arrival Processes”, *Proc. of Allerton Conference*, Monticello, IL, Sept 1999.
- [C18] S. Hanly and D. Tse, “Resource pooling and effective bandwidths for a CDMA link with spatial diversity” *Proc. of Allerton Conference*, Monticello, IL, Sept 1999.
- [C19] N. Zhang, A. Poon, R. Brodersen, D. Tse and S. Verdú, “Trade-offs of Performance and Single-Chip Implementation of Indoor Wireless Multi-access receivers”, “*Proc. of WCNC*”, New Orleans, Sept. 1999.
- [C20] J. Evans and D. Tse, “Linear Multiuser Receivers for Multipath Fading Channels”, *Proc. of Information Theory Workshop*, Kruger National Park, South Africa, June 1999.

- [C21] D. Tse and O. Zeitonui, "Performance of Linear Multiuser Receivers in Random Environments", *Proc. of Communication Theory Mini-Conference, ICC*, Vancouver, Canada, June 1999.
- [C22] M. Grossglauser and D. Tse, "A Time-Scale Decomposition Approach to Measurement-Based Admission Control", *Proceedings of Infocom*, New York City, March 1999.
- [C23] D. Tse and S. Verdú, "Optimum Multiuser Asymptotic Efficiency of CDMA with Random Spreading," *Proc. 1999 IEEE Information Theory Workshop on Detection, Estimation, Classification and Imaging*, p. 28, Feb. 24-26, 1999, Santa Fe, NM.
- [C24] C. Chuah, D. Tse and J.M. Kahn, "Capacity of Multi-Antenna Array Systems in Indoor Wireless Environment", *Proc. of IEEE Globecom*, Sydney, Australia, November 8-12, 1998.
- [C25] S. Hanly and D. Tse, "Multi-access Fading Channels: Delay-Limited Capacity", *Proceedings of IEEE International Symposium on Information Theory*, Boston, August 1998, p. 397.
- [C26] E. Telatar and D. Tse, "Capacity and Mutual Information of Broadband Multipath Fading Channels", *Proc. of IEEE International Symposium on Information Theory*, Boston, August 1998, p. 395.
- [C27] P. Viswanath, V. Anantharam and D. Tse, "Capacity of a Power-Controlled CDMA System with Linear Receivers", *Proc. of IEEE International Symposium on Information Theory*, Boston, August 1998, p. 121
- [C28] S. Hanly and D. Tse, "Min-Max Power Allocation for Successive Decoding", *Proc. of IEEE Information Theory Workshop*, Killarney, Ireland, June 1998, pp. 56-57.
- [C29] P. Viswanath, V. Anantharam and D. Tse, "Optimal Sequence, Power Control and Capacity of Synchronous CDMA Systems with Linear Multiuser Receivers", *Proc. of IEEE Information Theory Workshop*, Killarney, Ireland, June 1998, pp. 134-135.
- [C30] Kiran and D. Tse, "Effective Bandwidths and Effective Interference for Linear Multiuser Receivers in Asynchronous Channels", *Proc. of IEEE Information Theory Workshop*, Killarney, Ireland, June 1998, p. 141-142.
- [C31] D. Tse and S. Hanly, "Effective Bandwidths in Wireless Networks with Multiuser Receivers", *Proc. of INFOCOM Conference*, 1998. (This work received the Best Paper Award of the conference.)
- [C32] M. Grossglauser and D. Tse, "Measurement-based Call Admission Control: A Heavy Traffic Framework", *Proc. of IEEE Conference on Decision and Control*, San Diego, December 1997, pp. 1792-1797.
- [C33] D. Tse and S. Hanly, "Multiuser Demodulation: Effective Interference, Effective Bandwidths and Capacity", *Proc. of Allerton Conference*, 1997.
- [C34] M. Grossglauser and D. Tse, "A Framework for Robust Measurement-based Admission Control", *Proc. of ACM SIGCOMM*, Cannes, France, 1997.
- [C35] D. Tse, "Optimal Power Allocation over Parallel Broadcast Channels", *Proc. of International Symposium for Information Theory*, Ulm, Germany, 1997, p. 27.

- [C36] M. Grossglauser and D. Tse, "Robust Measurement-Based Admission Control", presented at the *International Teletraffic Congress 16*, Washington, D.C., June 1997. (invited talk)
- [C37] D. Tse and M. Grossglauser, "Measurement-Based Call Admission Control: Analysis and Simulations", *Proceedings of IEEE Infocom 1997*, Kobe, Japan.
- [C38] D. Tse, "Asymptotic Optimality of a Measurement-Based Admission Control Scheme", *Proceedings of the 34th Allerton Conference, Monticello, IL*, Oct. 1996.
- [C39] D. Tse and S. Hanly, "Capacity Region of the Multi-Access Fading Channel under Dynamic Resource Allocation and Polymatroid Optimization", *Proceedings of 1996 IEEE Information Theory Workshop*, Haifa, Israel, June 1996, p. 37.
- [C40] S. V. Hanly and D.N. Tse, "Multi-Access Fading Channels: Shannon and Delay-Limited Capacities", *Proc. of the 33rd Allerton Conference*, Monticello, IL, Oct., 1995.
- [C41] M. Grossglauser, S. Keshav and D. Tse, "RCBR: A Simple and Efficient Service for Multiple Time-Scale Traffic", *Proc. of ACM Sigcomm'95*, Boston MA, Aug. 1995, pp. 219-230.
- [C42] D. Tse, R.G. Gallager and J.N. Tsitsiklis, "Variable-rate Loss Compression Under Delay Constraints," presented at the *IEEE Information Theory Workshop on Information Theory, Multi-access and Queueing*, St. Louis, Missouri, April 1995.
- [C43] M. Grossglauser, S. Keshav and D. Tse, "The case against variable bit-rate services", *Proceedings of 5th Workshop on Network and Operating System Support for Digital Audio and Video*, Durham, H.H., April, 1995, pp. 307-310.
- [C44] D. Tse, R.G. Gallager and J.N. Tsitsiklis, "Statistical Multiplexing of Multiple Time-scale Sources", *Proceedings of the 3rd INFORMS Telecommunications Conference*, Boca Raton, Florida, March 1995, p. 21.
- [C45] D. Tse, R.G. Gallager, J.N. Tsitsiklis, "Variable-Rate Lossy Compression of Markov Sources Under Buffer Constraints", *Proceedings of IEEE Int. Symposium of Information Theory*, Trondheim, Norway, 1994.
- [C46] D. Tse, R.G. Gallager, J.N. Tsitsiklis, "Optimal Buffer Control for Variable-Rate Lossy Compression", *Proceedings of the 31st Allerton Conference*, Sept. 1993.
- [C47] D. Tse, M.A. Dahleh, J.N. Tsitsiklis, "Worst-Case Asymptotic Identification of Stable and Unstable Systems", *Proceedings of the 1992 American Automatic Control Conference*.
- [C48] S.R. Kulkarni and D. Tse, "A Paradigm for Class Identification Problems", *Proceedings of the Princeton Conference on Information Sciences and Systems*, pp. 442-447, March, 1992.
- [C49] D. Tse, M.A. Dahleh, J.N. Tsitsiklis, "Optimal Asymptotic Identification Under Bounded Disturbances", *Proceedings of the 1991 Conference on Decision and Control Systems*, Brighton, U.K., pp. 623-628, Dec. 1991.
- [C50] A.K.C. Wong, D. Tse, G.R. Heppler, K. Reub, "Robotic Vision Technology for Space Station and Satellite Applications" *Proceedings of the 42nd Congress of the International Astronautical Federation*, Oct. 7-11, 1991, Montreal, Canada.
- [C51] D. Tse, M.A. Dahleh, J.N. Tsitsiklis, "Robust and Optimal Identification in the ℓ_1 Norm", *Proceedings of the 1991 American Control Conference*, Boston, pp. 1786-1787, June, 1991.

- [C52] D. Tse, M.A. Dahleh, J.N. Tsitsiklis, “Optimal Asymptotic Worst-case Identification with applications on ℓ_1 and the gap metrics”, in *Recent Advances in Mathematical theory of Systems, Control, Networks and Signal Processing*, vol.I, eds. H. Kimura, S. Kodama, pp. 325-330, 1991.
- [C53] D. Tse, M.A. Dahleh, J.N. Tsitsiklis, “Worst-Case Identification For Robust Control”, in *Control of Uncertain Dynamic Systems*, eds. S.P. Bhattacharya, L.H.Keel, pp. 311-328, March, 1991.