

Curriculum Vitae

Prof. Helmut Bölcskei



Professor of Communication Theory
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Degrees/Higher Education

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| 1997 | PhD in Electrical Engineering,
Vienna University of Technology, Austria |
| 1994 | M.S. in Electrical Engineering, Vienna University of
Technology, Austria |

Professional Career

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| 2006–present | Full Professor, D-ITET, ETH Zurich |
| 2002–2006 | Assistant Professor, D-ITET, ETH Zurich |
| 2001–2002 | Assistant Professor of Electrical Engineering,
University of Illinois at Urbana-Champaign, IL, USA |
| 1999–2001 | Postdoctoral Researcher, Information Systems
Laboratory and Department of Statistics, Stanford
University |
| 1999–2001 | Member of founding team of Iospan Wireless Inc.,
San Jose, CA, USA, acquired by Intel Corp. in 2002 |
| 1994–1998 | Research and Teaching Assistant, Vienna
University of Technology, Austria |

Visiting Positions

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| 6/2001 | Heinrich-Hertz Institute Berlin, Germany |
| 2–3/1998 | ENST Paris, France |
| 2–5/1996 | Philips Research Laboratories Eindhoven,
The Netherlands |

Professional Activities

- Editor-in-Chief, IEEE Transactions on Information Theory
- Member of the Board of Governors, IEEE Information Theory Society
- TPC co-chair, IEEE International Symposium on Information Theory (ISIT) 2008, Toronto, Canada
- Member of editorial board of «Foundations and Trends in Networking», NOW publishers
- Past associate editor: IEEE Transactions on Information Theory, IEEE Transactions on Wireless Communications, IEEE Transactions on Signal Processing, EURASIP Journal on Applied Signal Processing

Honors and Awards

- 2011 EURASIP Fellow
- 2010 Vodafone Innovations Award
- 2009 IEEE Fellow
- 2006 IEEE Communications Society Leonard G. Abraham Best Paper Award
- 2005 «Golden Owl» Teaching Award, ETH Zurich
- 2001 IEEE Signal Processing Society Young Author Best Paper Award
- 1999–2001 Erwin Schrödinger Fellow, Austrian National Science Foundation

Membership in Societies

IEEE, AMS

Publications

www.nari.ee.ethz.ch/commth/pubs/viewpubs.php

Current Committee Activities within ETHZ

- Delegate of the ETHZ president for professorial appointments

Teaching

- Signals and Systems I
- Fundamentals of Wireless Communication
- Compressed Sensing

Facilities and Major Equipment

MIMO Wireless Lab

For more information please visit www.nari.ee.ethz.ch/~boelcskei

Communication Theory

Keywords

- Communication and Information Theory
- Mathematical Signal Processing
- Applied and Computational Harmonic Analysis

Current research interests and activities

- Compressed sensing and matrix completion
- Analysis and processing of high-dimensional data
- Learning in networks
- Capacity of wireless communication systems
- Frame theory

Focus

The Communication Theory Group (CTG) in the Communication Technology Laboratory performs research on theoretical, applied, and algorithmic aspects of the following areas: Information theory, mathematical signal processing, applied and computational harmonic analysis. We apply advanced concepts in probability theory, statistics, and functional analysis to gain insights on practical problems, sometimes going all the way to hardware implementation and system evaluation.

Mobile wireless Internet

With the advent of smart phones mobile wireless Internet systems will have to offer huge throughput and coverage improvements within the next decade. The key technologies to realize these improvements are multiple-input multiple-output (MIMO) wireless communication and interference management. Fig. 1 depicts the short-term average throughputs across the cell area achievable in the downlink of a wireless cellular system employing different antenna configurations ($T \times R$ denotes a setup with T antennas at the base station and R antennas at the terminal).

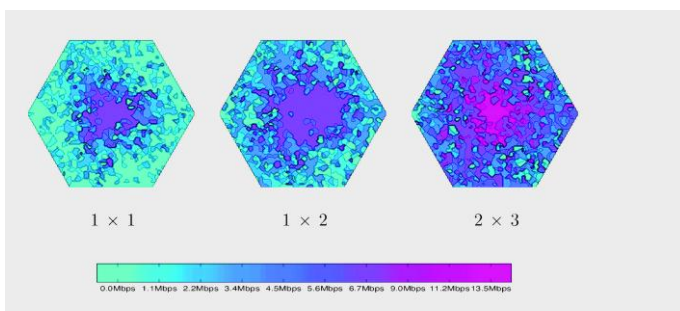


Figure 1: MIMO cellular systems offer significantly increased coverage and capacity.

The goal of CTG's research in this area is to contribute i) to a thorough understanding of interference in wireless networks and ii) to the design of interference management and MIMO wireless techniques that can meet the demands mandated by future mobile Internet systems. Our work in this field is subdivided into three different areas, namely information-theoretic analysis, transmitter/receiver design (signal processing algorithms and coding), and finally the VLSI implementation of algorithms.

Fig. 2 shows a soft-output MIMO sphere decoder ASIC based on the single-tree search paradigm invented and implemented in close collaboration between CTG/ETHZ and IIS/ETHZ.

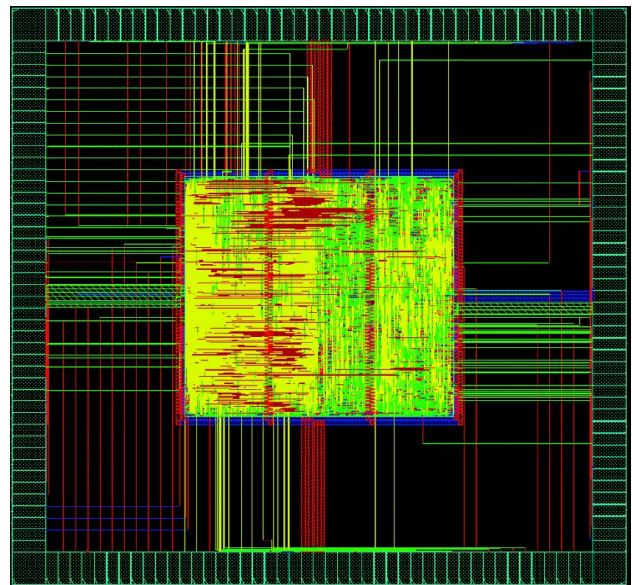


Figure 2: Layout of a single-tree search-based soft-output sphere decoder ASIC manufactured in 0.25 μm technology

Analysis and processing of high-dimensional data

The next major challenges in I&C technology arise from the massive (and continuously increasing) amounts of data that need to be processed in modern information technology applications. In 2007 the amount of information created world-wide exceeded the total available storage space world-wide (Source: IDC). Our work in this area aims at developing theoretical foundations for finding structure in high-dimensional data and exploiting this structure for information processing. The mathematical tools used in this area include harmonic analysis, probability theory, estimation theory, information theory, Banach space geometry, approximation theory, and learning theory.

For more information on our research group and our projects please see: www.nari.ee.ethz.ch/commth/