Prof. Dr. Helmut Bölcskei
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February 2021

I. CURRICULUM VITAE

Research

Applied Mathematics, Machine Learning Theory, Mathematical Signal Processing, Data Science, Statistics

Personal details

Born on May 29, 1970 in Mödling, Austria; Austrian nationality; married, one child

Education

1989 – 1994: Studies in electrical engineering, Vienna University of Technology, Vienna, Austria

Oct. 1994: Engineering diploma (M.S.) with highest honors

1994 – 1997: Doctoral studies in electrical engineering, Vienna University of Technology, Vienna, Austria

Nov. 1997: Ph.D. in electrical engineering with highest honors (doctoral dissertation: "Oversampled Filter Banks and Predictive Subband Coders," thesis advisors: Prof. F. Hlawatsch, Department of Electrical Engineering, Vienna University of Technology, and Prof. H. G. Feichtinger, Department of Mathematics, University of Vienna)

Academic work experience

Apr. 2019 – : Full Professor (o. Univ.-Prof.) of Mathematical Information Science, Department of Information Technology and Electrical Engineering, also associated with the Dept. of Mathematics, ETH Zurich, Zurich, Switzerland

Oct. 2006 – Mar. 2019: Full Professor (o. Univ.-Prof.) of Communication Theory, Department of Information Technology and Electrical Engineering, ETH Zurich, Zurich, Switzerland

Feb. 2002 – Sept. 2006: Assistant Professor (tenure track) of Communication Theory, Department of Information Technology and Electrical Engineering, ETH Zurich, Zurich, Switzerland

March 2001 – Jan. 2002: Assistant Professor (tenure track) of Electrical and Computer Engineering, Coordinated Science Laboratory and Department of Electrical Engineering, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, USA

Feb. 1999 – Feb. 2001: Post-doctoral researcher in the Information Systems Laboratory (with Prof. A. Paulraj), Dept. of Electrical Engineering, and in the Department of Statistics (with Prof. D. Donoho), Stanford University, Stanford, CA, USA

Sept. 1998: One-week stay at the Isaac Newton Institute for Mathematical Sciences, Cambridge, UK

Feb. 1998 – March 1998: Visiting Researcher at Ecole Nationale Supérieure des Télécommunications (ENST) Paris, Paris, France (with Prof. P. Duhamel)

May 1997 – Jan. 1999: University Assistant ("Universitätsassistent"), Department of Electrical Engineering, Vienna University of Technology, Vienna, Austria

Dec. 1994 – Apr. 1997: Research and Teaching Assistant ("wissenschaftlicher Mitarbeiter"), Department of Electrical Engineering, Vienna University of Technology, Vienna, Austria

Oct. – Nov. 1994: Research Assistant ("wissenschaftlicher Mitarbeiter"), Department of Mathematics, University of Vienna, Vienna, Austria

Industrial work experience

2007: Co-founder of *Celestrius AG*, Zurich, Switzerland, company liquidated in 2011

July 2004: Consulting for *Beceem Communications Inc.*, Santa Clara, CA, USA

June 2001: Visiting researcher at the *Heinrich-Hertz Institut für Nachrichtentechnik Berlin GmbH,* Berlin, Germany

March 2001 – July 2001: Consulting for *Iospan Wireless Inc.*, work on physical layer and system architecture of second generation "Air Burst" system

Feb. 1999 – Feb. 2001: Member of founding team and part-time member of technical staff in the startup company *Iospan* (formerly *Gigabit*) *Wireless Inc.*, San Jose, CA, USA, founded by Prof. A. Paulraj, acquired in 2002 by Intel Corp.; development of orthogonal frequency division multiple access (OFDMA)-based physical layer and system architecture for a cellular fixed broadband wireless access (BWA) system using multiple-antenna (MIMO) technology ("Air Burst" system), MIMO channel measurements and development of MIMO channel models for fixed BWA in the US MMDS band ($2.5 - 2.7$GHz)

Jan. 1998 – Dec. 1998: Consulting for the Austrian company *AKG* on low-delay audio coding

Feb. – May 1996: Visiting Researcher at *Philips Research Laboratories Eindhoven*, The Netherlands (work on image and video coding)

Awards and honors

2021 Rothschild Fellowship, Isaac Newton Institute for Mathematical Sciences, Cambridge University, Cambridge, UK

2016 Padovani Lecturer, IEEE Information Theory Society

Thomson Reuters (ISI) Highly Cited Researcher in the category *Computer Science*, 2014

IEEE Information Theory Society Distinguished Lecturer, 2013 – 2014

EURASIP Fellow 2011
("*In 2007, the EURASIP Administrative Committee (AdCom) initiated a Fellowship Programme, to recognize outstanding achievements of its members and volunteers. Each year, a select group of signal processing researchers are elevated to "EURASIP Fellow", the Association's most prestigious honor.*")

Invited speaker at the first EU-US Frontiers of Engineering (FoE) Meeting, Sept. 2010, Cambridge, UK

Vodafone Innovations Award 2010
("*Der Innovationspreis zeichnet exzellente Wissenschaftlerinnen und Wissenschaftler vorwiegend aus dem deutschen Sprachraum aus. Er ist mit 25.000 EUR dotiert. Bei der Auswahl finden herausragende Arbeiten, die die Entwicklung der Mobil- und Festnetzkommunikation zum Thema haben, eine besondere Beachtung.*")

Editor-in-chief ad interim, *IEEE Transactions on Information Theory*, Nov. 2013 – Dec. 2013

Editor-in-chief, *IEEE Transactions on Information Theory*, July 2010 – June 2013

Fellow of IEEE, class of 2009, nominated by IEEE Information Theory Society, citation: "For contributions to multiple-input multiple-output wireless communication and filter bank theory"

ICICS 2008/2009 Distinguished Lecture, The University of British Columbia, Vancouver, Canada

2006 IEEE Communications Society *Leonard G. Abraham Prize*
("*Given annually to the best original paper published in the IEEE Journal on Selected Areas in Communications in the past year.*")

2005 "Golden Owl" Teaching Award for the Department of Information Technology and Electrical Engineering, ETH Zurich

2001 IEEE Signal Processing Society Young Author Best Paper Award
("*The Young Author Best Paper Award honors the author(s) of an especially meritorious paper dealing with a subject related to the Society's technical scope and appearing in one of the Society's Transactions and who, upon the date of submission of the paper, is less than 30 years of age. Eligibility is based on a three-year window.*")

Erwin Schrödinger Fellowship (1999 – 2001) given by the Austrian National Science Foundation

Plenary lectures

"Fundamental limits of deep neural network learning," *Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, USA, Nov. 2019

"A mathematical theory of deep convolutional feature extraction networks," *SPIE Wavelets and Sparsity XVIII*, San Diego, CA, USA, Aug. 2019

"Vandermonde matrices and the large sieve," *GAMM Workshop on Mathematical Signal and Image Analysis*, Raitenhaslach, Germany, April 2019

"Vandermonde matrices and the large sieve," *Workshop on Smart Antennas (WSA)*, Berlin, Germany, March 2017

"The mathematics of deep learning," *North American School on Information Theory (NASIT)*, Duke University, Raleigh, NC, USA, June 2016

"Super-resolved system identification," *Kailath Lecture and Colloquium*, Stanford, CA, USA, Sept. 2015.

"Robust subspace clustering via thresholding," *International ITG Conference on Systems, Communications, and Coding*, Hamburg, Germany, Feb. 2015

"Theoretical challenges in MIMO wireless," *Marconi Society 40th Anniversary Symposium*, US National Academy of Sciences, Washington D.C., USA, Oct. 2014

"Signal recovery, uncertainty relations, and Minkowski dimension," *Matheon Workshop on Compressed Sensing and its Applications*, Berlin, Germany, Dec. 2013

"Rényi information dimension and degrees of freedom in vector interference channels," *Seventh IEEE Workshop on Advanced Information Processing for Wireless Communication Systems (AIPWCS)*, Aalborg, Denmark, Nov. 2013

"Rényi information dimension and degrees of freedom in vector interference channels," *IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, Darmstadt, Germany, June 2013

"Compressive system identification," *Kailath Lecture and Colloquium*, Stanford University, Stanford, CA, USA, Apr. 2013

"The SIMO pre-log can be larger than the SISO pre-log," *International ITG Workshop on Smart Antennas (WSA)*, Dresden, Germany, Mar. 2012

"Compressive system identification," *International Symposium on Wireless Communication Systems (ISWCS)*, Aachen, Germany, Nov. 2011

"Nonparametric identification of linear time-varying systems," *53rd International Symposium ELMAR*, Zadar, Croatia, Sept. 2011

"Uncertainty relations and signal recovery," *European Signal Processing Conference (EUSIPCO)*, Barcelona, Spain, Sept. 2011

"The SIMO pre-log can be larger than the SISO pre-log," *IEEE Communication Theory Workshop (CTW)*, Sitges, Spain, June 2011

"How sensitive is fading channel capacity to the channel model?," *International Conference on Wireless Communications and Signal Processing (WCSP)*, Suzhou, China, Oct. 2010

"On the sensitivity of noncoherent capacity to the channel model," *Kailath Lecture and Colloquium*, Stanford University, Stanford, CA, USA, Nov. 2009

"Mathematical roots of compressed sensing," *IEEE Information Theory Workshop (ITW)*, Taormina, Italy, Oct. 2009

"The case for optimum detection algorithms in MIMO wireless systems," *IEEE Israel Convention*, Eilat, Israel, Dec. 2008

"Capacity of underspread fading channels," *IEEE Sensor Array and Multichannel Signal Processing Workshop*, Darmstadt, Germany, July 2008

"Soft-output sphere decoding: Theory and VLSI implementation," *Conference on "Wireless Intelligent Networks" to celebrate the opening of the Wireless Intelligent Networking Center at Nile University*, Cairo, Egypt, Apr. 2008

"Sphere decoding: Theory and VLSI implementation," *IEEE Benelux/DSP Valley Signal Processing Symposium*, Antwerp, Belgium, March 2007

"Frequency-domain algorithms for efficient polynomial matrix inversion and QR decomposition," *IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Puerto Vallarta, Mexico, Dec. 2005

"Wideband OFDM communication," *IEEE International Symposium on Spread Spectrum Techniques and Applications (ISSSTA)*, Sydney, Australia, Sept. 2004

"Fundamental tradeoffs in MIMO wireless systems," *IEEE 6th CAS Workshop/Symposium on Emerging Technologies: Frontiers of Mobile and Wireless Communication*, Shanghai, China, June 2004

"Space-time modulation for real-world MIMO-OFDM systems," COST 273 Workshop on *"Opportunities of the Multidimensional Propagation Channel"*, Espoo, Finland, May 2002

"MIMO wireless communications," *IEEE Benelux Signal Processing Symposium (SPS)*, Leuven, Belgium, March 2002

"Digital signal processing challenges in MIMO wireless communications," *2001 IEEE Workshop on Signal Processing Systems (SIPS)*, Antwerp, Belgium, Sept. 2001

ERDŐS NUMBER

Erdős number: 3

- P. Erdős and J. H. van Lint, "On the average ratio of the smallest and largest prime divisor of n," *Nederl. Akad. Wetensch. Indag. Math.*, 44 (1982), 127–132.
- I. Hall, A. J. E. M. Janssen, A. W. J. Kolen, and J. H. van Lint, "Equidistant codes with distance 12," Discrete Mathematics 17 (1977), pp. 71–83.
- H. Bölcskei and A. J. E. M. Janssen, "Gabor frames, unimodularity, and window decay," *The Journal of Fourier Analysis and Applications*, Vol. 6, No. 3, 2000, pp. 255–276.

RESEARCH GRANTS OBTAINED

"Nonstationary graphical model discovery," (given by the *Swiss National Science Foundation (SNF)*), funding 229K (CHF), 9/2017 – 8/2021

"Multiuser and multicellular MIMO wireless systems," (given by the *Swiss National Science Foundation (SNF)*), funding 250K (CHF), jointly with Dr. J. Hansen (IKT/ETHZ), 10/2005 – 9/2008

"Multi-standard software defined radio for multimedia applications," (given by the *Swiss Federal Office for Professional Education and Technology (KTI/CTI)*), Industrial partner *BridgeCo AG, Dübendorf, Switzerland*, funding 387K (CHF), jointly with Prof. W. Fichtner (IIS, ETHZ), 3/2005 – 9/2006

"Performance assessment and coexistence issues of ultra-wideband radio systems (PACURS)," (given by the *Swiss Federal Office for Professional Education and Technology (KTI/CTI)*), Industrial partner *Swisscom Innovations AG*, funding 231K (CHF), 3/2004 – 2/2006

"Multi-user MIMO wireless systems," (given by the *Swiss National Science Foundation (SNF)*), funding 170K (CHF), 5/2003 – 4/2005

"Cooperative MIMO wireless networks," (given by the *Swiss Federal Office for Education and Science (BBW), COST-273*), funding 100K (CHF), jointly with Prof. A. Wittneben (IKT, ETHZ), 1/2003 – 12/2004

"Real-time MIMO-OFDM system for high-speed broadband wireless access," (given by *ETHZ Research Commission (TH and SEP)*), funding 1.2M (CHF), jointly with Prof. W. Fichtner (IIS, ETHZ), 8/2002 – 7/2005

Grant J1868–TEC (follow-up to J1629–TEC), "Redundant signal expansions in wireless communications," (given by the *Austrian National Science Foundation (FWF)*), funding 35K (US), 2/2000 – 1/2001

Grant J1629–TEC, "Redundant signal expansions in wireless communications," (given by the *Austrian National Science Foundation (FWF)*), funding 35K (US), 2/1999 – 1/2000

INDUSTRY SPONSORED RESEARCH

"Representation learning from deep generative models," with *Google, Zurich, Switzerland*, 2018, funding 15K (CHF)

"Relaying strategies for real-world wireless networks," with *Nokia Research Center (NRC) Helsinki, Finland*, 6/2006 – 12/2006, funding 42K (CHF)

"MIMO-OFDM system development and algorithm implementation for future mobile communications (MAGIC)," with *Siemens AG ICM PA*, Bocholt, Germany, 1/2005 – 12/2005, funding 320K (CHF), jointly with Prof. W. Fichtner (IIS, ETHZ)

"Multi-user MIMO communications," with *Nokia Research Center (NRC) Helsinki, Finland*, 5/2005 – 4/2006, funding 128K (CHF)

"Wideband distributed antenna systems," with *Nokia Research Center (NRC) Helsinki, Finland*, 5/2005 – 4/2006, funding 70K (CHF)

"MIMO-OFDM system development and algorithm implementation for future mobile communications (MAGIC)," with *Siemens AG ICM PA*, Bocholt, Germany, 1/2004 – 12/2004, funding 320K (CHF), jointly with Prof. W. Fichtner (IIS, ETHZ)

"Multi-antenna techniques for HSDPA (part of the national German 3GET project)," with *Nokia Research Center (NRC) Bochum, Germany*, 1/2004 – 12/2004, funding 175K (CHF)

"Code design for semi-coherent MIMO-OFDM systems (part of Nokia's 4G cellular systems research project)," with *Nokia Research Center (NRC) Helsinki, Finland*, 1/2004 – 12/2004, funding 70K (CHF)

"MIMO radio channel modeling and channel emulator development for 4G cellular and next-generation WLAN systems," with *Elektrobit Ltd., Oulu, Finland*, 1/2003 – 6/2004, funding 210K (CHF)

"WLAN MIMO radio channel measurements," with *Zyray Wireless Inc., San Diego, CA, USA*, 1/2003 – 3/2003, funding 18K (CHF)

"Code design for semi-coherent MIMO-OFDM systems (part of Nokia's 4G cellular systems research project)," with *Nokia Research Center (NRC) Helsinki, Finland*, 1/2003 – 12/2003, funding 125K (CHF)

EU PROJECTS

FP6 STREP "Multiple-access space-time coding testbed (MASCOT)," project coordinator *Forschungszentrum Telekommunikation Wien (FTW)*, 1/2006 – 12/2008, funding 1.95M (CHF), jointly with Prof. W. Fichtner (IIS, ETHZ)

FP6 STREP "Multi-element multi-hop backhaul reconfigurable antenna network (MEMBRANE)," project coordinator *Imperial College London, UK*, 1/2006 – 6/2008, funding 900K (CHF)

FP6 Network of Excellence "Network of excellence in communications (NEWCOM)," project coordinator *Istituto Superiore Mario Boella, Torino, Italy*, 1/2004 – 9/2005, funding 206K (CHF), jointly with Proff. D. Dahlhaus, H. A. Loeliger, and A. Wittneben (all ETHZ)

FP6 Integrated Project "Pervasive ultra-wideband low spectral energy radio systems (PULSERS) Phase II," project coordinator *Gesellschaft für Wissens- und Technologietransfer (GWT), Dresden, Germany*, 1/2006 – 12/2007, funding 500K (CHF), jointly with Prof. A. Wittneben (IKT, ETHZ)

FP6 Integrated Project "Pervasive ultra-wideband low spectral energy radio systems (PULSERS)," project coordinator *Gesellschaft für Wissens- und Technologietransfer (GWT), Dresden, Germany*, 1/2004 – 12/2005, funding 618K (CHF), jointly with Prof. A. Wittneben (IKT, ETHZ)

FP6 Integrated Project "Wireless world initiative new radio (WINNER)," project coordinator *Siemens AG, Germany*, 1/2004 – 12/2005, funding 687K (CHF)

Teaching activities

University of Illinois at Urbana-Champaign

- Aug. 2001 – Dec. 2002: "ECE310 - Digital Signal Processing," (4-units undergraduate course)

Swiss Federal Institute of Technology (ETH) Zurich

- since 2019: "Neural Network Theory," (3-units graduate course, fall semester, taught in English)
- since 2018: "Mathematics of Information," (5-units graduate course, summer semester, taught in English)
- since 2002: "Signal- und Systemtheorie I," (4-units undergraduate course, winter semester, taught in German)
- 2003 – 2016: "Fundamentals of Wireless Communication," (4-units graduate course, summer semester, taught in English)
- 2009 – 2017: "Harmonic Analysis: Theory and Applications in Advanced Signal Processing," (4-units graduate course, summer semester, taught in English)

Current PhD Students

Thomas Allard: Deep neural network learning algorithms

Recep Gül: Deep neural network learning of dynamical systems

Weigutian Ou: Deep neural networks on general data structures

Dmytro Perekrestenko: Fundamental limits of deep learning and deep generative modeling

PhD students graduated

V. Vlačić: "Identification results in neural network theory and linear operator theory," 2020

M. Tschannen, "Algorithms for model-based clustering and learned compression," 2018, ETH medal for outstanding PhD thesis

T. Wiatowski, "Harmonic analysis of deep convolutional neural networks," 2017, ETH medal for outstanding PhD thesis

C. Aubel, "Performance of super-resolution methods in parameter estimation and system identification," 2016, ETH medal for outstanding PhD thesis

D. Stotz, "Fractal dimension in information theory," 2015, ETH medal for outstanding PhD thesis

R. Heckel, "Sparse signal processing: Subspace clustering and system identification," 2014, ETH medal for outstanding PhD thesis

G. Pope, "Structured sparse signal recovery in general Hilbert spaces," 2013

P. Kuppinger, "General uncertainty relations and sparse signal recovery," 2011

V. I. Morgenshtern, "Crystallization and noncoherence in wireless communication," 2010, ETH medal for outstanding PhD thesis

D. Cescato, "Interpolation-based matrix arithmetics for MIMO-OFDM systems," 2010

J. Thukral, "Spatial multiplexing in multiuser networks with limited feedback," 2009

C. Akçaba, "Diversity-multiplexing tradeoff in relay and interference channels," 2009

C. Studer, "Iterative MIMO decoding: Algorithms and VLSI implementation aspects," 2009, co-advised with Prof. W. Fichtner, IIS/ETHZ, ETH medal for outstanding PhD thesis

P. Coronel, "Diversity-multiplexing tradeoff in selective fading channels," 2008

U. G. Schuster, "Wireless communication over wideband channels," 2007

M. Gärtner, "Space-time coding and multiple access in MIMO fading channels," 2007

M. Borgmann, "Noncoherent MIMO wideband communications," 2007

D. S. Baum, "Information-theoretic analysis of a class of MIMO channel measurement devices," 2007

A. P. Burg, "VLSI circuits for MIMO communication systems," 2006, co-advised with Prof. W. Fichtner, IIS/ETHZ, ETH medal for outstanding PhD thesis

EDITORSHIPS

Area editor for *Sampling Theory, Signal Processing, and Data Analysis*, Springer Nature, 1/2021 –

Member of editorial board of *Foundations and Trends in Communications and Information Theory*, 5/2012 – 12/2018

Member of editorial board of *Foundations and Trends in Networking*, 1/2005 – 12/2018

Member of editorial board of *IEEE Signal Processing Magazine*, 1/2012 – 12/2014

Associate editor for *IEEE Transactions on Information Theory*, 6/2007 – 5/2010

Associate editor for *IEEE Transactions on Wireless Communications*, 2/2002 – 12/2005

Associate editor for *EURASIP Journal on Applied Signal Processing*, 7/2003 – 6/2005

Associate editor for *IEEE Transactions on Signal Processing*, 5/2000 – 5/2005

Guest editor for a special issue on "Information-theoretic methods in data acquisition, analysis, and processing" in the *IEEE Journal on Selected Topics in Signal Processing*, Oct. 2018

Guest editor for a special issue on "Signal Processing for Multiple-Input Multiple-Output (MIMO) Wireless Communication Systems," in the *IEEE Transactions on Signal Processing*, Nov. 2003

Guest editor for a special section in *Signal Processing* (EURASIP) entitled "From Signal Processing Theory to Implementation," July 2003

CONFERENCE ORGANIZATION

General chair of *Workshop on Mathematical Data Science*, Dürnstein, Austria, 2019

Technical program co-chair of *IEEE Information Theory Workshop (ITW) 2016*, Cambridge, UK, 2016

Co-chair of *Joint Workshop on Coding and Communications (JWCC)*, Barcelona, Spain, 2014

Co-chair of *2014 International Zurich Seminar on Communications (IZS)*, Zurich, Switzerland, 2014

Co-chair of *2012 International Zurich Seminar on Communications (IZS)*, Zurich, Switzerland, 2012

Co-chair of *Joint Workshop on Coding and Communications (JWCC)*, Santo Stefano Belbo, Italy, 2010

Co-chair of *2010 International Zurich Seminar on Communications (IZS)*, Zurich, Switzerland, 2010

Technical program co-chair of *IEEE International Symposium on Information Theory (ISIT) 2008*, Toronto, Canada, 2008

Panel sessions co-chair of *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Las Vegas, NV, USA, 2008

Co-chair of *Joint Workshop on Coding and Communications (JWCC)*, Dürnstein, Austria, 2007

Special sessions and plenary talks co-chair of *European Signal Processing Conference (EUSIPCO)*, Florence, Italy, 2006

Technical program co-chair of *2006 IEEE Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, Cannes, France, 2006

Co-Chair of *2006 International Zurich Seminar on Communications (IZS)*, Zurich, Switzerland, 2006

Member of organizing committee for *UngerboeckFest (in honor of Dr. G. Ungerböck's 65th birthday)*, Hertenstein, Switzerland, 2005

Co-Chair of *2004 International Zurich Seminar on Communications (IZS)*, Zurich, Switzerland, 2004

Co-Chair of *Communication Theory Symposium*, *IEEE Global Telecommunications Conference (GLOBECOM)*, San Francisco, CA, USA, 2003

Co-Chair of *Advanced Signal Processing in Communications Symposium*, *IEEE International Conference on Communications (ICC)*, Anchorage, AK, USA, 2003

PROFESSIONAL ACTIVITIES

Member of the Velux Foundation's Villum Young Investigator Grant Committee, since 2018

Chair of IEEE Information Theory Society James L. Massey Award for Young Scholars Committee, 2017 – 2018

Member of the Master in Data Science admissions committee, ETH Zurich, since 2017

Member of IEEE Undergraduate and Graduate Teaching Award Committee, 2016 – 2017, chair of the committee 2017 – 2019

Member of search committee Dean STI, EPFL, 2016

Member of the international review panel for the evaluation of the Dept. of Electrical and Computer Engineering, TU Munich, 2016

Member of the Scientific Advisory Board, Swiss Innovation Valley, Switzerland, since 2015

Member of the Scientific Advisory Board, Fraunhofer Zukunftsstiftung, Fraunhofer Society, Germany, since 2015

Member of the IEEE Information Theory Society Board of Governors, 2015 – 2017

Member of the IEEE Information Theory Society *Claude E. Shannon Award Selection Committee*, 2015 – 2016

Member of the *Vodafone Innovations Award Committee*, since 2015

Member of the *IEEE Alexander Graham Bell Medal Committee*, 2015 – 2017

Member of review panel, LOEWE Program, Hessen, Germany, Technical University of Darmstadt, Darmstadt, Germany, Sept. 2013

Member of review panel, Zentrum für Innovation und Technologie (zit), Vienna, Austria, June 2013

ERC Advanced Grant Panel Member, 2013

Member of the IEEE Information Theory Society External Nominations Committee, 2013, chair of the committee 2014 – 2015

Member of the IEEE Information Theory Society Fellows Committee, 2013 – 2016, chair of the committee 2016 – 2018

Scientific advisory board, *Forschungszentrum für Telekommunikation Wien (ftw)*, 2010 – 2013

Member of the IEEE Information Theory Society Board of Governors, 2009 – 2011

Delegate for faculty searches of the president of ETH Zurich, since 2008

Member of the MS admissions committee, Dept. of Information Technology and Electrical Engineering, ETH Zurich, 2007 – 2010

Member of the *IEEE Signal Processing Society's Technical Committee on Signal Processing for Communications*, 2002 – 2008

Officer in the *European Signal Processing Society (EURASIP)*, 2002 – 2006

II. PUBLICATIONS AND PATENTS

5 representative papers marked with ∗

1. Edited book

1.1 H. Bölcskei, D. Gesbert, C. Papadias, and A. J. van der Veen, eds., "Space-time wireless systems: From array processing to MIMO communications," Cambridge University Press, 2006.

2. Invited book chapters

2.1 E. Riegler and H. Bölcskei, "Uncertainty relations and sparse signal recovery," *Information-Theoretic Methods in Data Science*, M. Rodrigues and Y. Eldar, Cambridge Univ. Press, 2021, pp. 163-196.

2.2 V. I. Morgenshtern and H. Bölcskei, "A short course on frame theory," *Mathematical Foundations for Signal Processing, Communications, and Networking*, E. Serpedin, T. Chen, and D. Rajan, eds., CRC Press, 2011, pp. 737–789.

2.3 G. Durisi, V. I. Morgenshtern, H. Bölcskei, U. G. Schuster, and S. Shamai (Shitz), "Information theory of underspread WSSUS channels," *Wireless Communications over Rapidly Time-Varying Channels*, F. Hlawatsch and G. Matz, eds., Academic Press, 2011, pp. 65–116.

2.4 H. Bölcskei, "Principles of MIMO-OFDM wireless systems," in *Signal Processing for Mobile Communications Handbook*, M. Ibnkahla, ed., CRC Press, 2004, pp. 12.1–12.22.

2.5 H. Bölcskei, "Orthogonal frequency division multiplexing based on offset QAM," in *Advances in Gabor Analysis*, H. G. Feichtinger and T. Strohmer, eds., Birkhäuser, 2003, pp. 321–352.

2.6 H. Bölcskei and A. J. Paulraj, "Multiple-input multiple-output (MIMO) wireless systems," in *The Communications Handbook*, 2nd edition, J. Gibson, ed., CRC Press, 2002, pp. 90.1–90.14.

2.7 H. Bölcskei and F. Hlawatsch, "Oversampled modulated filter banks," in *Gabor Analysis: Theory, Algorithms, and Applications*, H. G. Feichtinger and T. Strohmer, eds., Birkhäuser, 1998, pp. 295–322.

3.a Invited journal papers

3.1 D. Elbrächter, D. Perekrestenko, P. Grohs, and H. Bölcskei, "Deep neural network approximation theory," *IEEE Transactions on Information Theory*, 2021, to appear.

3.2 V. Vlačić and H. Bölcskei, "Neural network identifiability for a family of sigmoidal nonlinearities," *Constructive Approximation*, 2021, to appear.

3.3 G. Durisi and H. Bölcskei, "High-SNR capacity of wireless communication channels in the noncoherent setting: A primer," *International Journal of Electronics and Communications (AEÜ)*, Vol. 65, Issue 8, Aug. 2011, pp. 707–712.

3.4 H. Bölcskei, "MIMO-OFDM wireless systems: Basics, perspectives and challenges," *IEEE Wireless Communications*, Vol. 13, No. 4, Aug. 2006, pp. 31–37.

3.5 A. Burg, M. Borgmann, M. Wenk, M. Zellweger, W. Fichtner, and H. Bölcskei, "VLSI implementation of MIMO detection using the sphere decoding algorithm," *IEEE Journal of Solid-State Circuits*, Vol. 40, No. 7, July 2005, pp. 1566–1577.

3.6 A. J. Paulraj, D. A. Gore, R. U. Nabar, and H. Bölcskei, "An overview of MIMO communications - A key to Gigabit wireless," *Proceedings of the IEEE*, Vol. 92, No. 2, Feb. 2004, pp. 198–218.

3.7 R. U. Nabar, V. Erceg, H. Bölcskei, and A. J. Paulraj, "Performance of multi-antenna signaling strategies using dual-polarized antennas: Measurement results and analysis," *Wireless Personal Communications*, Vol. 23, Issue 1, 2002, pp. 31–44; reprinted from *Fourth International Symposium on Wireless Personal Multimedia Communications (WPMC)*, Sept. 2001, Aalborg, Denmark, pp. 175–180.

3.8 H. Bölcskei, A. J. Paulraj, K. V. S. Hari, R. U. Nabar, and W. W. Lu, "Fixed broadband wireless access: State of the art, challenges, and future directions," *IEEE Communications Magazine*, Vol. 39, No. 1, Jan. 2001, pp. 100–108.

3.b Journal papers published or accepted for publication

3.9 V. Vlačić and H. Bölcskei, "Affine symmetries and neural network identifiability," *Advances in Mathematics*, Vol. 376, Article 107485, pp. 1-72, Jan. 2021.

3.10 G. Alberti, H. Bölcskei, C. De Lellis, G. Koliander, and E. Riegler, "Lossless analog compression," *IEEE Trans. Information Theory*, Vol. 65, No. 11, pp. 7480-7513, Nov. 2019.

3.11 C. Aubel and H. Bölcskei, "Vandermonde matrices with nodes in the unit disk and the large sieve," *Applied and Computational Harmonic Analysis*, Vol. 47, No. 1, pp. 53-86, July 2019.

3.12 * H. Bölcskei, P. Grohs, G. Kutyniok, and P. Petersen, "Optimal approximation with sparsely connected deep neural networks," *SIAM Journal on Mathematics of Data Science*, Vol. 1, No. 1, pp. 8-45, 2019.

3.13 T. Wiatowski, P. Grohs, and H. Bölcskei, "Energy propagation in deep convolutional neural networks," *IEEE Trans. Information Theory*, Vol. 64, No. 7, pp. 4819-4842, Jul. 2018.

3.14 M. Tschannen and H. Bölcskei, "Noisy subspace clustering via matching pursuits," *IEEE Trans. Information Theory*, Vol. 64, No. 6, pp. 4081-4104, June 2018.

3.15 T. Wiatowski and H. Bölcskei, "A mathematical theory of deep convolutional neural networks for feature extraction," *IEEE Trans. Information Theory*, Vol. 64, No. 3, pp. 1845-1866, Mar. 2018.

3.16 C. Aubel, D. Stotz, and H. Bölcskei, "A theory of super-resolution from short-time Fourier transform measurements," *Journal of Fourier Analysis and Applications*, Vol. 24, No. 1, pp. 45-107, Feb. 2018.

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III. LECTURES

LECTURES

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