PHILIPP WALK

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PARTICULARS

CURRENT POSITION

02/2021-present **Technical University of Berlin (TU Berlin)**, Berlin, Germany.
Postdoctoral Researcher, Communications and Information Theory group of Prof. Giuseppe Caire at Dept. of Electrical Engineering & Computer Science

EDUCATION

03/2007-05/2014 **Technische Universität München (TU Munich)**, Munich, Germany
Ph.D. (Dr. rer. nat) with highest honors in Electrical and Computer Engineering
Dissertation: "Analysis of Convolutions with Support Restrictions"
Advisor: Prof. Holger Boche. Committee: Massimo Fornasier, Gerhard Kramer, Sandra Hirche.

10/1999-09/2006 TU Berlin, Berlin, Germany
M.S. (Dipl. Phys.) in Physics, Thesis: "The concept of algebraic states with application to simple quantum models as the XY-model"
Advisor: Prof. Rudie Seiler.

RESEARCH INTERESTS

My research interests span the areas of communication theory, signal processing, quantization, physical-layer design, compressed sensing, bilinear inverse problems, time-frequency analysis, UAV deployment, and positioning. I have a specific interest in deterministic blind deconvolution algorithms for a wide application in signal processing as wireless communication, imaging, phase retrieval, machine learning, and physical layer architectures.

ACADEMIC HONORS

10/2015-12/2017 DFG research grant "Structured Signal Models in Compressed Sensing", **California Institute of Technology (Caltech)**, Pasadena, CA.

02/2016-04/2016 Research grant for the Hausdorff trimester program "Mathematics of Signal Processing", **Hausdorff Research Institute for Mathematics**, Bonn, Germany.

POSITIONS

06/2019-01/2021 Staff Researcher, **Futurewei Technologies, Inc.**, in the Dept. of Wireless Research & Standards, Chicago, IL.

03/2019-05/2019 Visiting Postdoctoral Scholar, Communications and Information Theory group of Prof. Giuseppe Caire in the Dept. of Electrical Engineering & Computer Science at TU Berlin, Germany.

03/2018-02/2019 Postdoctoral Scholar, group of H. Jafarkhani in the EECS Dept.**University of California, Irvine**, CA. *Physical-layer designs for wireless networks. Optimal UAV deployments and path plannings.*

10/2015-02/2018 Postdoctoral Scholar, group of B. Hassibi in the EE Department at Caltech, CA. *Developed blind sporadic short-packet communication schemes for frequency-selective fading channels.*

06/2015-09/2015 Visiting Postdoctoral Scholar in the group of G. Caire at TU Berlin, Germany.

06/2014-09/2015 Postdoctoral Researcher, group of H. Boche at TU Munich, Germany
Designed a Semi-Blind Signaling Scheme for Wireless Networks.

10/2010-05/2014 Research Assistant, group of H. Boche at TU Munich, Germany
Investigated bilinear inverse problems with emphasize on convolutions and sparse signals. Proved general stability results for linear discrete-time invariant systems.

03/2007-09/2010 Research Assistant, group of H. Boche at TU Berlin, Germany
Developed spectral efficient modulation designs for Ultra-Wideband systems.

05/2005-03/2006 Teaching Assistant, Department of Mathematics, TU Berlin, Germany
Assistant in analysis classes for undergrad engineering students.

12/2001-06/2004 Student Research Assistant, group of Susanne Siebentritt at **Hahn-Meitner Institute**, Berlin, Germany. *Measured and determined solar cell characteristics.*

TEACHING EXPERIENCE

06/2017-09/2017 **Co-Mentor.** For Mattia Carrera "Summer SURF student program", Caltech.

05/2016-06/2016 **Instructor.** P. Walk & E. Tampubolon "Compressive Sampling", *Guest Lecture*, Summer 2016, TU Munich.

09/2014-06/2015 **Mentor.** For Henning Becker, *Master Thesis*, "PAPR compensation for OFDM using Phaseless Pilots", TU Munich.

10/2014-02/2015 **Instructor.** P. Walk & H. Boche, "Compressive Sampling", *Lecture*, Winter 2014/2015, TU Munich.

04/2014-05/2014 **Instructor.** H. Boche & P. Walk, "Compressive Sampling", *Lecture*, Summer 2014 and U. Mönich & P. Walk, "Fortgeschrittene Signaltheorie und Compressed Sensing (Advanced Signal Theory and Compressed Sensing)", *Lecture*, Summer 2014, TU Munich.

05/2013-05/2013 **Teaching Assistant.** U. Mönich & P. Walk, "Fortgeschrittene Signaltheorie (Advanced Signal Theory)", *Lecture*, Summer 2013, TU Munich.

04/2012-05/2012 **Teaching Assistant.** P. Jung & P. Walk, "Estimation Theory and Compressed Sensing", *Lecture*, Spring 2012, TU Munich.

10/2011-02/2012 **Teaching Assistant.** P. Jung & P. Walk, "Estimation Theory and Compressed Sensing", *Lecture*, Winter 2011, TU Munich.

05/2005-03/2006 **Teaching Assistant.** "Analysis II for Engineers", *Lecture* , TU Berlin.

PUBLICATIONS

JOURNAL PAPERS

[J1] **P. Walk**, P. Jung, B. Hassibi, and H. Jafarkhani, "MOCZ for blind short-packet communication: Practical aspects," *IEEE Transactions on Wireless Communications*, vol. 19, no. 10, pp. 6675–6692, Oct. 2020.

[J2] J. Guo, **P. Walk**, and H. Jafarkhani, "Optimal deployments of UAVs with directional antennas for a power-efficient coverage," *IEEE Transactions on Communications*, vol. 68, no. 8, pp. 5159–5174, Aug. 2020. eprint: 1911.07463 (arxiv).

[J3] **P. Walk**, P. Jung, and B. Hassibi, "MOCZ for blind short-packet communication: Basic principles," *IEEE Transactions on Wireless Communications*, vol. 18, no. 11, pp. 5080–5097, Nov. 2019.

[J4] **P. Walk**, P. Jung, and G. E. Pfander, "On the stability of sparse convolutions," *Applied and Computational Harmonic Analysis*, vol. 42, pp. 117–134, 2017. arXiv: 1409.6874.

[J5] **P. Walk** and P. Jung, "Approximation of Löwdin Orthogonalization to a Spectrally Efficient Orthogonal Overlapping PPM Design for UWB Impulse Radio," *EURASIP Journal on Applied Signal Processing*, vol. 92, no. 3, pp. 649–666, Mar. 2012. arXiv: 1109.3102.

[J6] J. Timmermann, **P. Walk**, A. A. Rashidi, W. Wiesbeck, and T. Zwick, "Compensation of a non-ideal UWB antenna performance," *Frequenz*, vol. 63, no. 9-10, pp. 183–186, Oct. 2009.

[J7] S. Siebentritt, **P. Walk**, U. Fiedeler, I. Lauermann, K. Rahne, M. C. Lux-Steiner, T. P. Niesen, and F. Karg, "MOCVD as a dry deposition method of ZnSe buffers for Cu(In,Ga)(S,Se)2 solar cells," *Progress in Photovoltaics*, vol. 12, no. 5, pp. 333–338, Jul. 2004.

[J8] S. Nishiwaki, S. Siebentritt, **P. Walk**, and M. C. Lux-Steiner, "A stacked chalcopyrite thin-film tandem solar cell with 1.2 v open-circuit voltage," *Progress in Photovoltaics: Research and Applications*, vol. 11, no. 4, pp. 243–248, Feb. 2003.

BOOKS & CHAPTERS

[B1] P. Jung and **P. Walk**, "Compressed sensing and its applications," in, H. Boche, A. R. Calderbank, G. Kutyniok., and J. Vybiral, Eds., ser. Applied and Numerical Harmonic Analysis. Springer, 2014, ch. Sparse Model Uncertainties in Compressed Sensing with Application to Convolutions and Sporadic Communication, pp. 283–313. arXiv: 1404.0218.

[B2] J. Timmermann, E. Pancera, **P. Walk**, W. Wiesbeck, and T. Zwick, "Ultra-wideband, short pulse electromagnetics 9," in. Springer, 2010, ch. Bit Error Rate of a Non-ideal Impulse Radio System, pp. 457–464.

CONFERENCE PAPERS

[C1] **P. Walk** and W. Xiao, "Multi-user MOCZ for mobile machine type communications," in *IEEE International Wireless Communication and Networking Conference*, Mar. 31, 2021.

[C2] J. Guo, **P. Walk**, and H. Jafarkhani, "Quantizers with parameterized distortion measures," in *Data Compression Conference*, IEEE, Mar. 2019, pp. 339–348.

[C3] **P. Walk** and U. Mitra, "Physical layer secure communications over wireless channels via common zeros," in *IEEE International Symposium on Information Theory*, (Talisa Hotel), Vail, Colorado, CO., Jun. 2018.

[C4] **P. Walk**, P. Jung, and B. Hassibi, "Constrained blind deconvolution using wirtinger flow methods," in *IEEE SampTA*, Tallin, Estontia, Jul. 2017.

[C5] ——, "Short-message communication and FIR system identification using huffman sequences," in *IEEE International Symposium on Information Theory*, Aachen, Germany, Jun. 2017. arXiv: 1702.00160.

[C6] **P. Walk**, H. Becker, and P. Jung, "Ofdm channel estimation via phase retrieval," in *49th Asilomar Conference on Signals, Systems and Computers*, Pacific Groove, CA, Nov. 2015, pp. 1161–1168. arXiv: 1512.04252.

[C7] ——, "Phaseless pilots for OFDM," in *International Symposium on Wireless Communication Systems*, Brussels, Belgium, Apr. 2015.

[C8] **P. Walk** and P. Jung, "Stable recovery from the magnitude of symmetrized Fourier measurements," in *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Florence, Italy, May 2014, pp. 1813–1816. arXiv: 1310.5895.

[C9] **P. Walk** and P. Jung, "On a reverse ℓ_2–inequality for sparse circular convolutions," in *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Vancouver, Canada, Jun. 2013, pp. 4638–4642.

[C10] **P. Walk** and P. Jung, "Compressed sensing on the image of bilinear maps," in *IEEE International Symposium on Information Theory*, Boston, MA, Jul. 2012, pp. 1291–1295. arXiv: 1205.4933.

[C11] **P. Walk**, P. Jung, and J. Timmermann, "Löwdin's approach for orthogonal pulses for UWB impulse radio," in *IEEE Workshop on Signal Processing Advances in Wireless Communications*, Marrakech, Maroc, Jun. 2010.

[C12] **P. Walk**, P. Jung, and J. Timmermann, "Löwdin transform on FCC optimized UWB pulses," in *IEEE Wireless Communications and Networking Conference*, Sydney, Australia, Mar. 2010.

[C13] J. Timmermann, A. A. Rashidi, **P. Walk**, E. Pancera, and T. Zwick, "Application of optimal pulse design in non-ideal ultra-wideband transmission," in *German Microwave Conference*, Munich, Germany, Mar. 2009, pp. 1–4.

[C14] J. Timmermann, E. Pancera, **P. Walk**, W. Wiesbeck, and T. Zwick, "Bit error rate of a non-ideal impulse radio system," in *European Electromagnetics Conference*, Lousanne, Switzerland, Jul. 2008.

INVITED PAPERS

[I1] **P. Walk**, P. Jung, G. Pfander, and B. Hassibi, "Ambiguities of convolutions with application to phase retrieval problems," in *50th Asilomar Conf.*, Pacific Groove, CA, Nov. 2016, pp. 1228–1234.

OTHER PAPERS

[O1] **P. Walk**, P. Jung, B. Hassibi, and H. Jafarkhani, "MOCZ for blind short-packet communication: Some practical aspects," *arxiv*, 2019. arXiv: 1902.02928.

[O2] **P. Walk**, P. Jung, and B. Hassibi, "Noncoherent short packet communication via modulation on conjugated zeros," *Arxiv*, May 2018. arXiv: 1805.07876.

[O3] **P. Walk** and B. Hassibi, "Stable deconvolution over the reals from additional autocorrelations," *Arxiv*, 2017. arXiv: 1710.07879.

[O4] **P. Walk**, P. Jung, G. Pfander, and B. Hassibi, "Blind deconvolution with additional autocorrelations via convex programs," *Arxiv*, 2017. arXiv: 1701.04890.

[O5] **P. Walk**, "Analysis of convolutions with support restrictions," PhD thesis, TU München, Sep. 2014.

[O6] **P. Walk** and P. Jung, "A stability result for sparse convolutions," *Arxiv*, 2013. arXiv: 1312.2222.

TALK & POSTER PRESENTATIONS

[T1] **P. Walk**, "MOCZ for blind short-packet communication over frequency-selective fading channels," in *Qualcomm Research Center*, San Diego, CA, Jan. 7, 2019.

[T2] P. Jung, **P. Walk**, D. Stoeger, F. Krahmer, and B. Hassibi, "From blind deconvolution to modulation on zeros of polynomials," in *5th International Huawei Professor's Day on ICT Algorithm and Design*, Moscow, Russia, Nov. 29, 2018.

[T3] **P. Walk**, "Blind short-packet communication via modulation on conjugated zeros," in *Futurewei*, Santa Clara, CA, Nov. 9, 2018.

[T4] P. Jung, **P. Walk**, and B. Hassibi, "Noncoherent/blind communication of short packets via modulation on conjugated zeros," in *Fraunhofer Heinrich-Hertz-Institute*, Berlin, Germany, Sep. 17, 2018.

[T5] B. Hassibi, **P. Walk**, P. Jung, and N. A. Rouhi, "Modulation on conjugate zeros and musings on "stochastic descent" in machine learning," in *Huawei University Days*, Chicago, IL, Aug. 2018.

[T6] **P. Walk**, B. Hassibi, and P. Jung, "Noncoherent short-packet communication via modulation on conjugated zeros," in *Intel*, Santa Clara, CA, Jun. 18, 2018.

[T7] **P. Walk**, U. Mitra, and B. Hassibi, "Physical layer secure communications over wireless channels via modulation on zeros," in *Information Theory and Applications Workshop*, San Diego, CA, Feb. 15, 2018.

[T8] **P. Walk**, "Blind deconvolution for short-message communications over wireless multipath channels," in *Center for Pervasive Communications and Computing Seminar*, Irvine, CA, Feb. 2018.

[T9] **P. Walk**, "Blind deconvolution methods for short message communications over unknown wireless channels," in *BLISS Seminar*, (Department of Electrical Engineering and Computer Science, UC Berkeley), Berkeley, CA, Dec. 2017.

[T10] ——, "A short-message communication over unknown FIR systems," in *Workshop on Dependent Component Analysis and Compressed Sensing*, (TU Dresden), Dresden, Germany, Jul. 11, 2017.

[T11] ——, "Ambiguities of discrete convolutions," in *Mathematics of Signal Processing*, (Hausdorff Institute of Mathematics), Bonn, Germany, Apr. 2017.

[T12] **P. Walk** and B. Hassibi, "Blind signal transmission using huffman sequences," in *Information Theory and Applications Workshop*, San Diego, CA, Feb. 16, 2017.

[T13] P. Jung, **P. Walk**, and B. Hassibi, "Blind deconvolution and polynomial factorization," in *International Biomedical and Astronomical Signal Processing (BASP) Workshop*, Villars-sur-Ollon, Switzerland, Jan. 2017.

[T14] P. Jung and **P. Walk**, "Semi-blind channel estimation using DCT-like phase retrieval," in *Compressed Sensing and its Application*, Berlin, Germany, Dec. 2015.

[T15] **P. Walk**, "On the (non)-stability of sparse convolutions," in *Seminar*, (Department of Electrical Engineering, USC), Los Angeles, CA, Dec. 2015.

[T16] ——, "Deconvolution: State of the art," in *17th Joint Conference on Communications and Coding (JCCC)*, Breuil-Cervinia, Italy, Mar. 2015.

[T17] **P. Walk**, P. Jung, and G. E. Pfander, "Norm bounds for the convolution of sparse signals," in *Workshop Modern Time-Frequency Analysis*, Strobl, Austria, Jun. 2014.

[T18] **P. Walk**, "Stable embedding of sparse convolutions," in *Matheon Workshop on Compresses Sensing and iths Applications*, Berlin, Germany, Dec. 2013.

[T19] ——, "Compressed sensing on sparse multiplications," in *Group Seminar M. Lustig*, (Deparment Electrical Engineering and Computer Science, UC Berkeley), Berkeley, CA, Jun. 2013.

[T20] ——, "Compressed sensing on the image of bilinear maps," in *Group Seminar V. H. Poor*, (Department of Electrical Engineering, Princetion University), Princeton, NJ, Jul. 2012.

[T21] ——, "A pulse stream model with sparsity in the input signal and in the channel matrix," in *15th Joint Conference on Communications and Coding (JCCC)*, Breuil-Cervinia, Italy, Mar. 2011.

[T22] **P. Walk**, P. Jung, and H. Boche, "Orthogonal overlapping spectral efficient PPM designs for UWB radios and beyond," in *DFG UKoLoS Colloquium*, Karlsruhe, Germany, Mar. 2011.

[T23] **P. Walk** and H. Boche, "Design and implementation of strategies for ultra-efficient impulse radio transmission -part 2- new orthogonalization methods for UWB," in *DFG UKoLoS Colloquium*, Erlangen, Germany, Feb. 2009.

[T24] ——, "Capacity of the continuous AWGN channel under peak-power and bandlimited constraints," in *DFG UKoLoS Colloquium*, (TU Ilmenau), Ilmenau, Germany, May 2008.

PATENTS

[P1] **P. Walk**, B. Hassibi, and P. Jung, "Systems and methods for communicating by modulating data on zeros," US 10,797,926 B2, Oct. 6, 2020.

[P2] **P. Walk**, B. Hassibi, P. Jung, and H. Jafarkhani, "Systems and methods for communicating by modulating data on zeros in the presence of channel impairments," US 10,804,982 B2, Oct. 13, 2020.

SERVICE

- Reviewer (Journals) - *IEEE Transaction of Network Science and Engineering, IEEE Transactions on Communications, IEEE Signal Processing Letters, IEEE Transactions on Signal Processing, Electronic Letters, Advances in Computational Mathematics, and Elsevier Signal Processing.*
- Reviewer (Conferences) - *IZS 2008, IEEE ICASSP 2010, IEEE SPAWC 2013, IEEE GlobCom 2015, IEEE GlobalSIP 2015, SampTA 2015, IEEE ICC 2017, IEEE WCNC 2018, and DCC 2019.*
- Chairing (Conferences) - *IEEE WCNC 2021*

MEMBERSHIP

- Member of IEEE since 2009
- Member of IEEE ComSoc since 2010

PERSONAL

- Citizen of Germany.
- Proficient in German and English. Working knowledge of French.
- Proficient in MATLAB & Simulink, Wolfram Mathematica, Python, C++, and Unix.