## Activity Report 2014–2015

**Institute of Communications Engineering** 

Prof. Dr.-Ing. Martin Bossert Prof. Dr.-Ing. Robert Fischer Prof. Dr. Dr.-Ing. Wolfgang Minker







ulm university universität

#### Impressum

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## Preface

The institute for *Communications Engineering* provides research and teaching for several courses of study in the area of communications within the faculty of *Electrical Engineering, Computer Science, and Psychology* of the *Ulm University*. Since 2014 the institute is largely responsible for the international Master Course *Communications Technology*. Research areas and offered lectures and labs range from physical-layer methods over reliable and secure information transmission in time and space, up to man-machine interfaces.

The present report covers all activities of members of our institute from January 2014 through December 2015.

# People

## **Professors**

Prof. Dr.-Ing. Martin Bossert Prof. Dr.-Ing. Robert Fischer Prof. Dr. Dr.-Ing. Wolfgang Minker

Associated and Retired Professors Prof. Dr.-Ing. Uwe-Carsten Fiebig Prof. Dr. Hans Peter Großmann Prof. Dr.-Ing. Jürgen Lindner

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### **Senior Researchers**

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## **Research Assistants**

Oleg Akhtiamov, M.Sc. Patricia Braunger, M.Sc. Dipl.-Ing. Martin Frassl Tatiana Gasanova, M.Sc. Dipl.-Ing. Günther Haas Hansjörg Hofmann, M.Sc. Katharina Juhnke, M.Sc. Dipl.-Ing. David Kracht Wenhui Li, M.Sc. Juliana Miehle, M.Sc. Mostafa Hosni Mohamed, M.Sc. Sven Müelich, M.Sc. Dipl.-Inf. Florian Nothdurft Dipl.-Inf. Eva Peiker-Feil Louisa Pragst, M.Sc. Dipl.-Inf. Florian Pregizer Sven Puchinger, B.Sc. Dipl.-Ing. Martin Schüssel Maxim Sidorov, M.Sc. Dipl.-Ing. Susanne Sparrer Anastasiia Spirina, M.Sc. Sebastian Stern, M.Sc. Florian Wäckerle, M.Sc. George Yammine, M.Sc.

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# **2** Visitors and Visits

## **Visiting Scholars**

<ul> <li>Siberian Federal University and Siberian State Aerospace U yarsk, Russia</li> <li>Anastasiia Spirina</li> </ul>	University, Krasno- 03/2014
Princess Sumaya University for Technology Amman and Jord dan	lan University, Jor-
<ul> <li>Prot. Wejdan Abu Alhija and Prot. Al-Wahadini</li> <li>Siberian Federal University and Siberian State Aerospace U varsk. Russia</li> </ul>	03/2014 University, Krasno-
Prof. Eugene Semenkin	03/2014, 06/2015
Prof. Zoraida Callejas	03/2014, 06/2015
<ul> <li>University of Alicante, Spain</li> <li>Prof. Joan-Josep Climent</li> </ul>	07/2014
<ul> <li>German University Cairo (GUC), Cairo, Egypt</li> <li>Injy Khairy, Nardine Raafat Basta</li> </ul>	07–08/2014
<ul> <li>University of Helsinki, Finland</li> <li>Prof. Kristiina Jokinen</li> </ul>	06/2015
<ul> <li>University of the Witwatersrand Johannesburg, South Africa Dr. Ing. Jaco Versfeld</li> </ul>	07/2015
<ul> <li>Sun Yat-sen University, Guangdong, China</li> <li>Prof. Li Chen</li> </ul>	07–09/2015

## **Research Stays at other Universities**

University of Granada, Spain	
Wolfgang Minker, Stefan Ultes	05/2014, 10/2014, 04/2015
University of Helsinki, Finland	
Wolfgang Minker, Florian Nothdurft	05/2014, 08/2015

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<ul> <li>University of Tartu, Estonia</li> <li>Wolfgang Minker, Florian Nothdurft</li> </ul>	08/2014, 02/2015
<ul> <li>Canadian Mathematical Society, Banff, Canada Martin Bossert</li> </ul>	10/2015
<ul> <li>University of British Columbia, Vancouver, Canada Martin Bossert</li> </ul>	10/2015
<ul> <li>University of Menoa, Hawaii, USA Martin Bossert</li> </ul>	10/2015
<ul> <li>University of Granada, Spain</li> <li>Wolfgang Minker, Stefan Ultes, Florian Nothdurft</li> </ul>	10/2015
<ul> <li>University of Melbourne, Australia</li> <li>Martin Bossert</li> </ul>	11–12/2015

#### Antonia Wachter-Zeh

Award of the Ulmer Universitätsgesellschaft e.V. for the most outstanding Dissertation, July 2014 Decoding of Block and Convolutional Codes in Rank Metric

#### George Yammine

ARGUS Research Award 2014 A Comparision of Noncoherent Receivers Based on Different Modulation Schemes

## Alexander Zeh

Ehrenpreis der Jury der Deutsch-Französischen Hochschule (DFH), Nov. 2014

#### Alexander Zeh

Vodafone Foundation for Research, Sponsorship Prize for Natural and Engineering Sciences, June 2015

A detailed description of the modules is available online.

Advanced Channel Coding	(English)		Master	2L/1E
Symbol-by-Symbol APP De	ecoding; Iter	erative Decoding	of Concatenated (	Codes;
LDPC Codes; Algebraic List	Decoding			

## Angewandte Mathematik für Ingenieure (German) Master 3L/1E

(Applied Mathematics for Engineers)

Stochastic Processes; Normal Forms of Matrices and their Application in System Theory; Special Functions (e.g., Bessel Functions) and their Application; Algebraic Structurs (e.g., Finite Fields)

Applied Information Theory (English) Master 3L/2E/1P Uncertainty (Entropy); Mutual Information; Source Coding Theorem; Source Coding Schemes (Shannon–Fano, Huffman, Tunstall, Arithmetic Coding); Universal Source Coding (Lempel–Ziv, Elias–Willems); Channel Capacity and Channel Coding Theorem; Gaussian Channel; Random Coding; Multi-User Information Theory; Dirty Paper Coding; Tomlinson–Harashima Precoding; Information Theory and Cryptology

#### Benutzerschnittstellen (German)

Bachelor/Master 2L/2S

Master 3L/2E/1P

(User Interfaces)

Introduction into the area of human-computer interaction (HCI); Focus: design and development principles of multimodal user interfaces; Usability engineering and evaluation of multimodal user interfaces

#### Channel Coding (English)

Block Codes (BCH, Reed–Solomon, Reed–Muller, Hamming, Simplex, Golay); Decoding Algorithms (Majority Logic, Algebraic, Soft, Hard, GMD); Convolutional Codes and Decoding (Viterbi, Fano, Zigangirov–Jelinek); Generalized Code Concatenation; Coded Modulation

#### Communications Engineering Seminar (German/English) Master 2S

each semester a current, changing topic from the fields of Communications Engineering, Digital Transmission, Information Theory, Coding Theory, and Signal Processing and its related disciplines is addressed

Communication Systems	(English)	Master 2L/1E
Mobile Radio Channel;	Basics of Mobile Communication	Systems; GSM and
UMTS		

#### Compressed Sensing (English) Master 2L/1E

Geometry of *N* Dimensions; Geometrical Interpretation of Systems of Linear Equations; Convex Polytopes; Arrangements of Hyperplanes; Approximation Theory; Distance Measures in Banach Spaces; Optimization and Linear Programing; Sampling by Compressed Sensing; Data Acquisition by Compressed Sensing

**Dialogue Systems** (German)

Introduction into the area of multimodal spoken natural language dialogue systems; Focus: Acoustic Processing; Speech Signal Analysis; Speech Recognition; Spoken Natural Language Understanding; Dialogue Processing and Speech Synthesis

#### Dialogue Systems Project (German/English) Master 4-6S

Multimodal spoken language dialogue systems; component development; practical studies; evaluation

#### **Design, Implementation and Evaluation of Dialogue Systems Project (for Cognitive Systems)** (English) Master 6S

Spoken dialogue systems development; human factor studies; human-centred design approach; practical studies; evaluation

#### **Digital Communications** (English)

Equivalent Complex Baseband; Pulse-Amplitude Modulation (PAM); Variants of PAM Transmission Schemes; Signal-Space Representation; Digital Frequency and Phase Modulation; Channel Models; Equalization of Dispersive Channels; Or-thogonal Frequency-Division Multiplexing (OFDM)

Master 4L/2E

Master 2L/2E

Digital Communications LAB (English)

0. Introduction to MATLAB; 1. Digital Pulse Amplitude Modulation; 2. Implementation of PAM Transmission in MATLAB; 3. Variants of PAM Transmission Schemes; 4. Noncoherent Reception; 5. Signal Space Representation

**Einführung in die Nachrichtentechnik** (German) Bachelor 3L/2E/2P (Introduction to Communication Engineering)

History and Milestones of Communications; Models in Communications; Shannons Uncertainty and Source Coding; Signals for Transmission of Information Channels; Decision Theory; Error Probabilty; Channel Coding Theorem; Error Correcting Codes; Reliable Data Transmission; Multiple Access; Routing; Security

#### **Embedded Security** (German)

Master 3L/1E

Implementation and Side-Channel Attacks in Cryptology; Countermeasures to Implementation Attacks; Arithmetic for Cryptographic Hardware; Random Number Generators; Physical Unclonable Functions; Digital Tachograph System; Secure Software Download for Electronic Control Units in Cars

**Iterative Methods for Wireless Communications** (English) Master 2L/1E Fix-Point Iteration; Convergence and Convergence Rate of Iterative Methods; Vector-Valued Transmission; (Iterative) Vector Equalization; Probability Theory for Iterative Decoding; Tanner Graph; Low-Density Parity Check Codes; BCJR Algorithm; Turbo Codes; Iterative Joint Demapping, Equalization, and Decoding (Turbo Equalization)

**Multiuser Communications and MIMO Systems** (English) Master 3L/1E MIMO Communications; Performance Criteria; Introduction to Lattices; Lattice Decoding and the "Sphere Decoder"; Equalization via Lattice Reduction; "Writing on Dirty Paper"; Multiuser Communications; Advanced Transmitter-Side Techniques; Interference Channel

Satellite Communications and Navigation (English) Master 2L/1E History, Development, and Potential of Satellite Communications; Satellite Orbits; Launch and Installation in Orbit; Modulation and Multiple Access; Satellite Channel; Link Budget Calculations; Mobile Satellite Communication Systems; Satellite Navigation

Master 4P

Seminar zur Industriepraxis (German/English) Bachelor/Master 3S Subject-related knowledge and experience from professional practice; experience the business of a typical workday; carry out typical engineering tasks in research and development, quality control, and technical distribution; gain insight into modern techniques and facilities for development and fabrication of electric, electronic, mechatronic and mechanical devices as well as software and hardware components and systems; learn typical operating procedures and organization in industry, as well as the social structure in companies

#### Signal Theory (English)

Master 2L/2E

Part I: Stochastic Signals: Random Variables and their Characterization; Principles of Estimation; Stochastic Processes and their Characterization; Mean-Square Estimation and Ergodicity; Part II: Deterministic Signals: Sampling and Interpolation; Principles of Compressed Sensing

Signale und Systeme	(German)
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Bachelor 3L/2E/2T/1P

(Signals and Systems)

Discrete Signals and Systems; z-Transformation; Generalized Functions and Distributions; Continuous Signals and Systems; Fourier-Transformation; Sampling Theorem; Fast Fourier Transform; Laplace-Transformation its Application to Continuous LTI Systems; Stochastic Processes

- Statistical Signal Processing(English, until 2013/14)Master 3L/1EConcept of Random Variables; Functions of Random Variables; Stochastic Processes; Spectral Representation and Spectrum Estimation; Mean Square Estimation
- Theory of Digital Networks (English)Master 3L/2E/1PHierarchical Structure of Networks; OSI Model; Physical Layer; Framing; ARQ;<br/>Multiple Access (Aloha, CSMA, Token, ...); Queuing Theory; Routing (Bellman–<br/>Ford, Dijkstra)

## 5.1 Research Topics

The research carried out at the institute is divided into the subsequent four groups.

### **Algebraic Coding Theory**

Block and convolutional codes for error correction and detection over Hamming, rank, and combinatorial metrics are constructed and analyzed. The main focus is also on the soft- and hard-decision and list decoding of these code classes. Especially soft-decision decoding of Reed-Solomon codes is an important research area. The applications are random linear network coding, storage coding, compressed sensing, interleaved codes, concatenated codes, and hybrid ARQ protocols. Recently, the application of algebraic coding for cryptology was started.

### **Bio Information Theory**

Information and communication theory is also applicable for living species, namely the DNA in cells is a storage which is read and transmitted. The particular projects are discrete models of genetic regulatory networks (random Boolean networks), overlapping genes, and next generation sequencing. In particular the erroneous measurements can be treated with methods from reliable data transmission and coding theory improves the labeling of the DNA fragments.

#### **Communication Theory**

The members of the Communication Theory group address the challenges of nextgeneration communications systems. The main focus is on the mathematical and theoretical foundations of communication and signal processing schemes. This includes equalization methods and the utilization of interference in multiantenna and multiuser systems, in particular, in form of precoding. The problems caused by nonlinearities in the transmission channel, both, the peak-power problem (e.g., in OFDM transmission), as well as nonlinear transmission media (e.g., fiber optics) are addressed. Moreover, the structure of signal is exploited, e.g., via compressed sensing methods, and transmission schemes without any channel knowledge are designed.

#### **Dialogue Systems**

The Dialogue Systems Group has placed its general research focus on the development and evaluation of user-friendly Spoken Language Dialogue Systems (SLDS). This objective is based on the following major aspects: adaptive dialogue management, assistiveness as well as evaluation and usability issues.

The Dialogue Systems Group is joint founder of the intersdisciplinary Competence Center Perception and Interactive Technologies. Research groups from Ulm University aim at developing innovative technologies in different application domains and settings for the human-computer interaction. Major research areas include sensor-based models for perception, learning mechanisms and adaptivity, interactive systems in networked applications, ubiquitous computing, multimedia and visualization as well as spoken language dialogue systems interaction and multimodality. The center proposes a framework for fundamental and applied research and combines different interdisciplinary issues.

## 5.2 Research Projects

#### **DFG Projects (German Research Council)**

During 2014–2015 the following projects were supported by the German Research Council "Deutsche Forschungsgemeinschaft" (DFG).<sup>1</sup>

#### Assistives und adaptives Dialogmanagement

Project Leader: Minker, Grant: SFB Transregio 62 TP B01 Duration: 96 months, Begin: February 2009

## The Evolutive Adaptation of the Transriptional Information Transmission in E.Coli

Project Leader: Bossert, Grant: Bo 867/25-2 (SPP InKomBio) Duration: 48 months, Begin: January 2010, End: January 2014

#### Finding New Overlapping Genes and their Theory (FOG-Theory)

Project Leader: Bossert, Grant: Bo 867/23-2 (SPP InKoMBio) Duration: 60 months, Begin: January 2010, End: March 2016

#### **Coordination Project InKoMBio**

Project Leader: Bossert, Grant: Bo 867/31-3 Duration: 60 months, Begin: January 2010, End: March 2016

#### Methoden der Kanalcodierung für Compressed Sensing

Project Leader: Bossert, Grant: Bo 867/27-2 Duration: 36 months, Begin: April 2011, End: April 2014

#### **Decoding in Weighted Combinatorial and Other Metrics**

Project Leader: Bossert, Grant: Bo 867/28-2 Duration: 24 months, Begin: April 2012, End: April 2014

#### Interrelations between Channel Coding and Precoding in Transmission Strategies for Broadcast Channels and in Network Coding

Project Leader: Bossert, Grant: Bo 867/29-3 (SPP COIN), cooperation with Profs. Fischer and Huber Duration: 24 months, Begin: October 2013

<sup>1</sup>SPP: "Schwerpunktprogramm" (priority project); SFB: "Sonderforschungsbereich" (SFB).

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#### Interrelations between Channel Coding and Precoding in Transmission Strategies for Broadcast Channels and in Network Coding

Project Leader: Fischer, Grant: Fi 982/4-3 (SPP COIN), cooperation with Profs. Bossert and Huber Duration: 24 months, Begin: October 2013

#### Analyse der Informationsverarbeitung in molekularen Netzwerken mithilfe der Kommunikationstheorie diskreter Prozesse

Project Leader: Schober, Grant: SCHO 1576/1-1 (SPP InKoMBio) Duration: 18 months, Begin: January 2014, End: July 2014

#### Verbesserte und zuverlässige RNA-Sequenzierung: Einzelzell-Transkriptomik zur Analyse bakterieller Individualität

Project Leader: Bossert, Grant: Bo 867/30-1 (SPP InKoMBio) Duration: 24 months, Begin: January 2014

#### Rang-Metrik in der Codierungstheorie und im maschinellen Lernen

Project Leader: Bossert, Grant: Bo 867/32-1 Duration: 36 months, Begin: January 2014

#### Diskret-wertige, dünn besetzte Signale: Theorie, Algorithmen und Anwendungen

Project Leader: Fischer, Grant: Fi 982/8-1, cooperation with Profs. Kutyniok and Pfander

Duration: 24 months, Begin: October 2014

#### DFG Priority Program (SPP) InKoMBio (Homepage: www.inkombio.de)

Prof. Martin Bossert is the coordinator of the DFG priority program DFG SPP 1395 "Informations- und Kommunikationstheorie in der Molekularbiologie (InKomBio)" The program committee consists of Prof. Dr.-Ing. M. Bossert, Prof. Dr.-Ing. J. Hagenauer (Technische Universität München), Prof. Dr. H. P. Herzel (Humboldt-Universität Berlin), and Prof. Dr. M. Kühl (Universität Ulm).

*Description:* In the middle of the 20th century, information theory and molecular genetics have gone through a great history of success: namely the fundamental work of Shannon in 1948, which was giving rise to the modern information- and communication society we are living in, and also the discovery of the double he-lix structure of DNA by Watson and Crick in 1953, which was the beginning of

contemporary genetics and its use in medicine. The information read from the DNA, is transmitted, duplicated, changed (mutated) and is used for controlling many processes in and in between cells. All these procedures can be described and analyzed with models and methods of information theory. We are convinced that information- and communication theorists, together with biologists and medical scientists can contribute to a better understanding of processes in the cell concerning communication, even though there have been significant results in research over the last years. In information theory, transmission of information is viewed in an abstract way, so it is expected that independently of concrete realizations, concepts, modules and results can be applied on molecular communication processes. Therefore the program focuses exclusively on assisting interdisciplinary projects in between information- and communication scientists on one side, and biologists and medical scientists on the other side. Modern Biology, often referred to as the key science of the 21th century, is currently undergoing a change. New theoretical concepts, modern methods of data analysis and mathematical models will play a strategical role in molecular biology and this can only be accomplished by intensive interdisciplinary collaboration. This program intends to encourage and assist this collaboration.

#### **BMBF Projects (Federal Ministry of Education and Research)**

#### EUREKA-Projekt SASER (Safe and Secure European Routing): Adaptive Modulations- und Codierungsverfahren für flexible und sichere optische Metro- und Firmennetze (ADVAntage-NET)

Project Leader: Fischer, Grant: 16BP12406 Duration: 42 months, Begin: August 2012, End: December 2015

#### EU — Horizon 2020

#### KRISTINA: A Knowledge-Based Information Agent with Social Competence and Human Interaction Capabilities

Project Leader: Minker, Grant: HORIZON 2020-LEIT-ICT 22 - 2014 Duration: 36 months, Begin: March 2015

#### **Industry Project**

#### Lower-Power-Mobile TV Tuner Architecture

Project Leader: Fischer, Grant: Sony Deutschland GmbH Stuttgart Duration: 12 months, Begin: June 2015 The publications are sorted according to the respective professor, which coincides with the research topics (Bossert: Groups A and B; Fischer and Lindner: Group C; Minker: Group D).

## Publications by Prof. Bossert's Group

- [1] Martin Bossert and Sergey Bezzateev. A Unified View on Known Algebraic Decoding Algorithms and New Decoding Concepts. *IEEE Transactions on Information Theory*, 59(11):7320–7336, 2013.
- [2] Matthias Hiller, Ludwig Kürzinger, Georg Sigl, Sven Müelich, Sven Puchinger, and Martin Bossert. Low-Area Reed Decoding in a Generalized Concatenated Code Construction for PUFs. In *IEEE Computer Society Annual Symposium on VLSI*, Montpellier, France, July 2015.
- [3] Karim Ishak, Sven Müelich, Sven Puchinger, and Martin Bossert. Code-Based Cryptosystems Using Generalized Concatenated Codes. In *Computer Algebra in Coding Theory and Cryptography (CACTC)*, Kalamata, Greece, July 2015.
- [4] David Kracht and Steffen Schober. Using the Davey-MacKay Code Construction for Barcodes in DNA Sequencing. In Proceedings of the International Symposium on Turbo Codes and Iterative Information Processing (ISTC), pages 142– 146, 2014.
- [5] David Kracht and Steffen Schober. Insertion and Deletion Correcting DNA Barcodes Based on Watermarks. *BMC Bioinformatics*, 16(1):1–14, 2015.
- [6] Wenhui Li, Johan S.R. Nielsen, Sven Puchinger, and Vladimir Sidorenko. Solving Shift Register Problems over Skew Polynomial Rings using Module Minimisation. In International Workshop on Coding and Cryptography, Paris, France, April 2015.
- [7] Katharina Mir, Klaus Neuhaus, Martin Bossert, and Steffen Schober. Short Barcodes for Next Generation Sequencing. *PLoS ONE*, 8(12):e82933, December 2013.
- [8] Katharina Mir and Steffen Schober. Investigation of genetic code optimality for overlapping protein coding sequences. In *Proc. 8th International Symposium on Turbo Codes and Iterative Information Processing (ISTC)*, Bremen, Germany, August 2014.

- [9] Katharina Mir and Steffen Schober. Selection Pressure in Alternative Reading Frames. *PLoS ONE*, 9(10):e108768, October 2014.
- [10] Mostafa Mohamed and Martin Bossert. A Chase-like Decoding Algorithm for Reed–Solomon Codes Based on the Extended Euclidean Algorithm. In Proceedings of the 10th International ITG Conference on Systems, Communications and Coding (SCC), Hamburg, Germany, February 2015.
- [11] Mostafa Mohamed and Martin Bossert. Combinatorial Metrics and Collaborative Error/Erasure Decoding for Translational Metrics. In Proceedings of the IITP RAS 39th interdisciplinary School-Conference "Information Technologies and Systems" (ITaS), Sochi, Russia, September 2015.
- [12] Mostafa Mohamed, Johan S.R. Nielsen, and Martin Bossert. Reduced List-Decoding of Reed–Solomon Codes Using Reliability Information. In *Proceedings* of the 21st International Symposium on Mathematical Theory of Networks and Systems (MTNS), Groningen, the Netherlands, July 2014.
- [13] Mostafa Mohamed, Shrief Rizkalla, Henning Zörlein, and Martin Bossert. Deterministic Compressed Sensing with Power Decoding for Complex Reed–Solomon Codes. In Proc. 10th International ITG Conference on Systems, Communication and Coding (SCC), Hamburg, Germany, February 2015.
- [14] Sven Müelich, Sven Puchinger, Martin Bossert, Matthias Hiller, and Georg Sigl. Error Correction for Physical Unclonable Functions Using Generalized Concatenated Codes. In International Workshop on Algebraic and Combinatorical Coding Theory, Svetlogorsk, Russia, September 2014.
- [15] Johan S.R. Nielsen. Fast Kötter-Nielsen-Høholdt Interpolation in the Guruswami– Sudan Algorithm. In International Workshop on Algebraic and Combinatorial Coding Theory, Svetlogorsk, Russia, September 2014.
- [16] Johan S.R. Nielsen. Power Decoding of Reed-Solomon Codes Revisited. In *International Castle Meeting on Coding Theory and Applications*, Palmela, Portugal, September 2014.
- [17] Johan S.R. Nielsen. Power Decoding Reed–Solomon Codes Up to the Johnson Radius. In International Workshop on Algebraic and Combinatorial Coding Theory, Svetlogorsk, Russia, September 2014.
- [18] Johan S.R. Nielsen and Alexander Zeh. Multi-Trial Guruswami–Sudan Decoding for Generalised Reed–Solomon Codes. *Designs, Codes and Cryptography*, 73(2):507–527, 2014.
- [19] Sven Puchinger, Michael Cyran, Robert F. H. Fischer, Martin Bossert, and Johannes B. Huber. Error Correction for Differential Linear Network Coding in Slowly-Varying Networks. In 10th International ITG Conference on Systems, Communications and Coding, Hamburg, Germany, February 2015.

- [20] Sven Puchinger, Sven Müelich, Martin Bossert, Matthias Hiller, and Georg Sigl. On Error Correction for Physical Unclonable Functions. In 10th International ITG Conference on Systems, Communications and Coding, Hamburg, Germany, February 2015. VDE.
- [21] Sven Puchinger, Antonia Wachter-Zeh, and Martin Bossert. Improved Decoding of Partial Unit Memory Codes Using List Decoding of Reed-Solomon Codes. In *International Zurich Seminar on Communications*, Zurich, Switzerland, February 2014.
- [22] Antonia Wachter-Zeh, Markus Stinner, and Vladimir Sidorenko. Convolutional Codes in Rank Metric with Application to Random Network Coding. *IEEE Transactions on Information Theory*, 61(6):3199–3213, June 2015.
- [23] Antonia Wachter-Zeh and Alexander Zeh. List and Unique Error-Erasure Decoding of Interleaved Gabidulin Codes with Interpolation Techniques. *Designs, Codes and Cryptography*, 73(2):547–570, 2014.
- [24] Antonia Wachter-Zeh, Alexander Zeh, and Martin Bossert. Decoding Interleaved Reed–Solomon Codes Beyond their Joint Error-Correcting Capability. *Designs, Codes and Cryptography*, 71(2):261–281, 2014.
- [25] Henning Zörlein, Akram Faisal, and Martin Bossert. Dictionary Adaptation in Sparse Recovery Based on Different Types of Coherence. In Proc. 2nd International Workshop on Compressed Sensing applied to Radar (CoSeRa), Bonn, Germany, September 2013.
- [26] Henning Zörlein, Thomas Leichtle, and Martin Bossert. Sparsity Aware Simplex Algorithms for Sparse Recovery. In Proc. 10th International ITG Conference on Systems, Communication and Coding (SCC), Hamburg, Germany, February 2015.
- [27] Henning Zörlein and Martin Bossert. Coherence Optimization and Best Complex Antipodal Spherical Codes. *IEEE Transactions on Signal Processing*, 63(24):6606–6615, Dec 2015.

## **Publications by Prof. Fischer's Group**

- [1] Michael Cyran, Robert F.H. Fischer, and Johannes B. Huber. Selection Precoding for the Finite-Field Multiplicative Matrix Channel. *IEEE Communications Letters*, 18(2):360–363, February 2014.
- [2] Robert F.H. Fischer and Melanie Bense. Noncoherent Decision-Feedback Equalization in Massive MIMO Systems. In Proceedings of International Zurich Seminar (IZS), Zurich, Switzerland, February 2014.

- [3] Robert F.H. Fischer, Melanie Bense, and Clemens Stierstorfer. Noncoherent Joint Decision-Feedback Detection in Multi-User Massive MIMO Systems. In Proceedings of International ITG/IEEE Workshop on Smart Antennas, Erlangen, Germany, March 2014.
- [4] Robert F.H. Fischer and Shayan Hassanpour. Equalization in Fiber-Optic Transmission Systems: Theoretical Limits and Lattice- Reduction-Aided Techniques. In ITG-Fachtagung Photonische Netze, Leipzig, Germany, May 2015.
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- [10] Susanne Sparrer and Robert F.H. Fischer. Adapting Compressed Sensing Algorithms to Discrete Sparse Signals. In *Proceedings of International ITG/IEEE Workshop on Smart Antennas*, Erlangen, Germany, March 2014.
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- [14] Hannes Stahl, Jan Mietzner, and Robert F.H. Fischer. A Sub-Nyquist Radar System Based on Optimized Sensing Matrices Derived via Sparse Rulers. In 3rd International Workshop on Compressed Sensing Theory and its Applications to Radar, Sonar and Remote Sensing, June 2015. 16–19 June 2015.
- [15] Sebastian Stern and Robert F.H. Fischer. OFDM vs. Single-Carrier Modulation: A New View on the PAR Behavior. In Proceedings of 17. International OFDM Workshop (InOWo), Essen, Germany, August 2014.
- [16] Sebastian Stern and Robert F.H. Fischer. Hierarchical Precoding for the Network MIMO Downlink. In Proceedings of 10. International ITG Conference on Systems, Communications, and Coding (SCC), Hamburg, Germany, February 2015.
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- [1] Gregor Behnke, Denis Ponomaryov, Marvin Schiller, Pascal Bercher, Florian Nothdurft, Birte Glimm, and Susanne Biundo. Coherence Across Components in Cognitive Systems - One Ontology to Rule Them All. In Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI 2015). AAAI Press, 2015.
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- [3] Michael Glodek, Frank Honold, Thomas Geier, Gerald Krell, Florian Nothdurft, Stephan Reuter, Felix Schüssel, Thilo Hoernle, Klaus Dietmayer, Wolfgang Minker, Susanne Biundo, Michael Weber, Günther Palm, and Friedhelm Schwenker. Fusion Paradigms in Cognitive Technical Systems for Human– Computer Interaction. *Neurocomputing*, 161(0):17–37, 2015.
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- [5] Florian Nothdurft, Gregor Behnke, Pascal Bercher, Susanne Biundo, and Wolfgang Minker. The Interplay of User-Centered Dialog Systems and AI Planning. In Proceedings of the 16th Annual Meeting of the Special Interest Group on Discourse and Dialogue (SIGDIAL), page 344–353, Prague, Czech Republic, September 2015. Association for Computational Linguistics.
- [6] Louisa Pragst, Stefan Ultes, Matthias Kraus, and Wolfgang Minker. Adaptive Dialogue Management in the KRISTINA Project for Multicultural Health Care Applications. In Proceedings of the 19thWorkshop on the Semantics and Pragmatics of Dialogue (SEMDIAL), pages 202–203, August 2015.
- [7] Alexander Schmitt and Stefan Ultes. Interaction Quality: Assessing the Quality of Ongoing Spoken Dialog Interaction by Experts—And How It Relates to User Satisfaction. *Speech Communication*, 74:12–36, November 2015.
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- [15] Sergey Zablotskiy and Wolfgang Minker. Sub-word language modeling for Russian LVCSR. In *Proceedings of the 17th International Conference, SPECOM*, September 2015.

### Publications by Other Members of the Institute

- [1] Mohamad Mostafa, Werner G. Teich, and Jürgen Lindner. Approximation of Activation Functions for Vector Equalization Based on Recurrent Neural Networks. In *Turbo Codes and Iterative Information Processing (ISTC), 2014 8th International Symposium on*, pages 52–56. IEEE, 2014.
- [2] Mohamad Mostafa, Werner G. Teich, and Jürgen Lindner. Local Stability Analysis of Discrete-Time, Continuous-State, Complex-Valued Recurrent Neural Networks with Inner State Feedback. *Neural Networks and Learning Systems, IEEE Transactions on*, 25(4):830–836, 2014.
- [3] Mohamad Mostafa, Werner G. Teich, and Jürgen Lindner. Approximation of Activation Functions for Vector Equalization based on Recurrent Neural Networks. In

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- [4] Giuseppe Oliveri, Mohamad Mostafa, Werner Teich, and Jürgen Lindner. Advanced Low Power, High Speed Nonlinear Signal Processing: An Analog VLSI Example. In WinnComm-Europe 2015, pages 48–56, 2015.
- [5] Giuseppe Oliveri, Hermann Schumacher, Mohamad Mostafa, Werner G. Teich, and Jürgen Lindner. Low Power High Speed Adaptive Vector Equalization: From the Nonlinear Algorithm to a Reconfigurable Analog Circuit. In *IC1004 10th MC and Scientific Meeting*, *TD*(14)10037, Aalborg, Denmark, 2014. COST.
- [6] Eva Peiker, George Yammine, Werner G. Teich, and Jürgen Lindner. Increasing the Bandwidth Efficiency of OFDM-N/MFSK. In OFDM 2014; 18th International OFDM Workshop 2014 (InOWo'14); Proceedings of, pages 1–8. VDE, 2014.
- [7] F. Pregizer, M. Birk, and M. Schussel. Forward Error Correction for Data Dissemination in MANET. In IEEE Fourth International Conference on Consumer Electronics Berlin (ICCE-Berlin), pages 495–499, Sept 2014.
- [8] Florian Pregizer and Alexander Sauer. Priority Based Data Dissemination in MANET. *Transactions on Networks and Communications*, 3(1):111, 2015.
- [9] Martin Schussel and Florian Pregizer. Coverage Gaps in Fingerprinting Based Indoor Positioning: The Use of Hybrid Gaussian Processes. In International Conference on Indoor Positioning and Indoor Navigation (IPIN), pages 1–9, Oct 2015.
- [10] Werner G. Teich and Ji Lianghai. Variance Transfer Chart Analysis of an OFDM-IDMA System with Carrier Frequency Offset. In Vehicular Technology Conference (VTC Fall), 2014 IEEE 80th, pages 1–6. IEEE, 2014.
- [11] George Yammine, Eva Peiker, Werner G. Teich, and Jürgen Lindner. Improved Performance of Coded OFDM-MFSK Using Combined Alphabets and Extended Mapping. In Turbo Codes and Iterative Information Processing (ISTC), 2014 8th International Symposium on, pages 17–21. IEEE, 2014.

## **7** Seminars

- Dr.-Ing. Christian Senger (University of Toronto). Sierpinski Prefactors in the Guruswami-Sudan Interpolation Step, January 17, 2014.
- Kevin Anbuhl. Adaptive Audiokompression f
  ür Sprachkommunikation in mobilen Ad-hoc-Netzwerken, January 31, 2014.
- Maurus Birk. Zuverlässige Audioübertragung in mobilen Ad-hoc-Netzwerken. January 31, 2014.
- Bernd Steinle. Analyse der Möglichkeiten und Grenzen serieller Datenübertragung von Datenraten jenseits 10 Gbps auf Leiterkarten in Mobilfunk-Basisstationen, February 17, 2014.
- Marco Falke. Efficient Sphere Decoding, February 17, 2014.
- Frederik Walter. Power Decoding of Reed-Solomon Codes Using Module Minimisation, April 04, 2014.
- Michael Scholz. Anwendung von Emotionserkennung in IVR-Systemen auf Mensch-Mensch-Dialoge, April 14, 2014.
- Shrief Rizkalla. Reed-Solomon Codes over the Complex Field Connection to Compressed Sensing, April 15, 2014.
- George Yammine. A Comparison of Noncoherent Receivers Based on Different Modulation Schemes, May 19, 2014.
- Thomas Leichtle. Utilization of Sparsity Awareness in the Simplex Algorithm, June 2, 2014.
- Matthias Kraus. Creation of User-Adaptive Dialogue for User Simulator Evaluation, July 14, 2014.
- Prof. Dr.-Ing. Zoran Utkovski (University Goce Delcev Stip, Macedonia). Communication in the Non-coherent Setting: The Multiple Access and the Random Access Channel, July 16, 2014.
- Roberto Gandía Blanquer (Miguel Hernández University of Elche, Spain). Increasing Forward Error Correcting Codes Capabilities with Convolutional Codes Over Any Finite Field, July 22, 2014.
- Prof. Joan-Josep Climent (University of Alicante, Spain). Concatenated Convolutional Codes From Linear Systems Theory Point of View, July 24, 2014.

- Dr.-Ing. Antonia Wachter-Zeh (Technion-Israel Institute of Technology, Haifa). List Decoding of Crisscross Error Patterns, July 24, 2014.
- Dr.-Ing. Alexander Zeh (Technion-Israel Institute of Technology, Haifa). An Improved Lower Bound on the Minimum Distance of Quasi-Cyclic Codes, July 24, 2014.
- Mostafa Khalili Marandi. Cycle-Slip-Robust Fiber-Optic Communications Using Rotationally Invariant Codes, July 30, 2014.
- Prof. Jörg Kliewer (New Jersey Institute of Technology, USA). Coordination in Networks: An Information-Theoretic Approach, August 08, 2014.
- Dr. Johan S.R. Nielsen. Fast Kötter-Nielsen-Høholdt Interpolation in the Guruswami-Sudan Algorithm, August 15, 2014.
- Dimitri Wolf. NFC gestützte Indoor Positionierung von Mobilgeräten mittels "Time of flight" Messungen, September 12, 2014.
- María Platero Sánchez. Analysis of an Extended Data Set for Interaction Quality Recognition, September 15, 2014.
- Michael Walter (DLR Oberpfaffenhofen). Experimental Verification of the Non-Stationary Statistical Model for V2V Scatter Channels, September 29, 2014.
- Shayan Hassanpourmatikolaei. Assessment of Lattice-Reduction-Aided Precoding for Fiber-Optic Transmission Systems, October 20, 2014.
- Alexander Sauer. Prioritätsbasierte Datenverteilung in mobilen Ad-hoc-Netzwerken, November 03, 2014.
- Tobias Schmidke. Interaktive Handlungsplanung, November 03, 2014.
- Hans Nienhaus (Daimler AG Ulm). Development of a Speech Dialog System for China, December 15, 2014.
- Usman Shamim. Performance Evaluation of OFDM-IDMA for Channels with Carrier Frequency Offsets, February 09, 2015.
- Shahriar Hussain. Implementation of Secure Linear Network Coding, February 09, 2015.
- Rubén Lambea. IQ-adaptive Statistical Spoken Dialogue Management, February 25, 2015.
- Reza Pourghorbani. Towards Multimodal Emotion Recognition, March 09, 2015.
- Tao Ding. Alamouti Coding and Decoding Scheme in Filter-Bank-Based Multicarrier System, March 18, 2015.
- Mennatallah Ibrahim. Equalization for Fiber-Optic Transmission Systems using Digital Signal Processing, April 08, 2015.

- Benedikt Meinecke. Schätzung der Kanalstatistik in "Massive MIMO", April 08, 2015.
- Ahmed Moheeb Emara. Decoding Complex Reed-Solomon Codes Beyond Half the Minimum Distance, April 27, 2015.
- Joao Carneiro. Network-Enabled Universal IR Remote Control for Home Entertainment Systems, April 27, 2015.
- David Mödinger. Decoding of Gabidulin Codes using Module Minimisation, May 21, 2015.
- Karim Abdalla Farag Ishak. Code-Based Cryptosystems using Concatenated Structures, June 15, 2015.
- Muhammad Shan Ur Rehman. Feature Selection and Feature Transformation Methods for Natural Language Call Routing, July 06, 2015.
- Prof. Li Chen (Sun Yat-sen University, China). Progressive Algebraic Soft-Decision Decoding of Reed–Solomon Codes July 29, 2015.
- Sameh Eldessoki. Peak-to-Average-Power Reduction for FBMC-based MIMO Systems, August 17, 2015.
- Hannes Stahl. Compressive Sensing für luftgestützte Radaranwendungen, September 28, 2015.
- Juliana Miehle. IQ-adaptive Statistical Dialogue Management using Gaussian Processes, October 21, 2015.
- Louisa Pragst. Multimodal Adaptive Dialogue Management in OwlSpeak, October 21, 2015.
- Thomas Alexander Westphal. Channel Estimation in Massive MIMO, October 26, 2015.
- Prachi Vaishnav. Evaluation of Digital Adaptive Beamforming, November 02, 2015.
- Patrizia Di Campli San Vito. User Evaluation of User-adaptive Dialogue, November 16, 2015.
- Yeicatl Ramos Vazquez. Multi-Stream Precoding for the Wireless Backhaul, December 2, 2015.
- Jakob Landesberger. Konzeption und Evaluisierung von lexikalischer und syntaktischer Adaption bei Sprachdialogen mit einem Fahrzeug, December 09, 2015.
- Pengfei Cao. Power-Space Profile Estimation in Noncoherent Massive MIMO, December 21, 2015.

- Holger Mandry. Multicastbasierte Audiokommunikation in mobilen Ad-Hoc Netzwerken, December 21, 2015.
- Manuel Heiß. Evaluation smarter Broadcastprotokolle f
  ür MANETs, December 21, 2015.

## 8.1 Supervised Ph.D. Theses

- Mohamad Mostafa. Equalization and Decoding A Continous- Time Dynamical Approach, Institute of Communications Engineering, Ulm University, 2014. Reviewers: Prof. J. Lindner, Prof. L. Kocarev, Ss. Cyril and Methodius University in Skopje, Macedonia, and BioCircuits Institute, University of California, San Diego, USA.
- Johannes Klotz. On Canalizing Boolean Functions, Institute of Communications Engineering, Ulm University, 2014.

Reviewers: Prof. M. Bossert, Prof. I. Große, University of Halle-Wittenberg.

- Thanawat Thiasiriphet. Applications of Ultrawideband in Communications and Ranging, Institute of Communications Engineering, Ulm University, 2014.
   Reviewers: Prof. J. Lindner, Prof. R. Thomä, Ilmenau University of Technology.
- Hansjörg Hofmann. Intuitive Speech Interface Technology for Information Exchange Tasks, Institute of Communications Engineering, Ulm University, 2014. Reviewers: Prof. W. Minker, Prof. K. Jokinen, University of Helsinki, Finland.
- Ulrich Epple. OFDM Receiver Concept for the Aeronautical Communications System LDACS1 to Cope with Impulsive Interference, Institute of Communications Engineering, Ulm University, 2014.
   Reviewers: Prof. J. Lindner, Prof. U.-C. Fiebig, DLR Oberpfaffenhofen, and Prof. W. Koch, University of Erlangen-Nürnberg.
- Eva Peiker-Feil. Increasing the Bandwidth Efficiency of OFDM-MFSK, Institute of Communications Engineering, Ulm University, 2014.
   Reviewers: Prof. J. Lindner, Prof. A. Czylwik, University of Duisburg-Essen.
- Katharina Schilling. Theoretical Aspects of Overlapping Genes, University of Erlangen-Nürnberg, 2015.
   Reviewers: Prof. M. Bossert, Prof. H.A. Kestler, Friedrich Schiller University Jena.
- Gregor Bertrand. Situation- and User-Adaptive Dialogue Management, Institute of Communications Engineering, Ulm University, 2015.
   Reviewers: Prof. W. Minker, apl. Prof. H. Traue, Ulm University.
- Wenhui Li. Decoding Evaluation Codes and their Interleaving, Institute of Com-

munications Engineering, Ulm University, 2015. Reviewers: Prof. M. Bossert, Prof. H.-A. Loeliger, ETH Zurich.

- Tatiana Olegovna Gasanova. Novel Methods for Text Preprocessing and Classification, Institute of Communications Engineering, Ulm University, 2015.
   Reviewers: Prof. W. Minker, Prof. E. Semenkin, Siberean State Aerospace University, Krasnojarsk, and Prof. G. Palm, Ulm University
- Henning Alexander Zörlein. Channel Coding Inspired Contributions to Compressed Sensing, Institute of Communications Engineering, Ulm University, 2015. Reviewers: Prof. M. Bossert, Prof. N. Görtz, Vienna University of Technology.
- Ksenia Zablotskaya. Automatic Estimation of User's Verbal Intelligence, Inst. of Communications Engineering, Ulm University, 2015.
   Reviewers: Prof. W. Minker, Prof. M. McTear, University of Ulster, and apl. Prof. H. Traue, Ulm University.
- Stefan Ultes. User-centred Adaptive Spoken Dialogue Modelling, Inst. of Communications Engineering, Ulm University, 2015.
   Reviewers: Prof. W. Minker, Prof. R. López-Cózar Delgado, University of Granada.
- Michael Walter. Scattering in Non-Stationary Mobile-to-Mobile Communications Channels, Institute of Communications Engineering, Ulm University, 2015.
   Reviewers: Prof. R. Fischer, Prof. U.-C. Fiebig, DLR Oberpfaffenhofen.
- Sergey Zablotskiy. Lexical and Language Modeling for Russian Large Vocabulary Continuous Speech Recognition, Inst. of Communications Engineering, Ulm University, 2015.

Reviewers: Prof. W. Minker, Prof. A. Wendemuth, Otto-von-Guericke-University Magdeburg, and Prof. A. Karpov, ITMO University, Saint Petersburg, Russia.

## 8.2 Co-Supervised Ph.D. Theses

- Michael Mirbach. Lokalisierung ultrabreitbandiger Transmitter in hochpermittiven Medien, Ulm University, 2014.
   Reviewers: Prof. W. Menzel, Prof. J. Lindner.
- ir. S.S. Gishkori. Compressive Sampling for Wireless Communications, TU Delft, The Netherlands, 2014.
   Reviewers: Prof. R. Fischer, Prof. V. Lottici, Prof. dr. F. Le Chevalier, Prof. dr. K.L.M. Bertels.
- Jiun-Hung Yu. A Partial-Inverse Approach to Decoding Reed-Solomon Codes and Polynomial Remainder Codes, ETH Zurich, 2014.
   Reviewers: Prof. H.-A. Loeliger, Prof. M. Bossert.
- Antje Westenberger. Simultane Zustands- und Existenzschätzung mit chronologisch ungeordneten Sensordaten für die Fahrzeugumfelderfassung, Ulm University, 2014.

Reviewers: Prof. K. Dietmayer, Prof. M. Bossert.

- Martin Benedikt Schels. Multiple Classifier Systems in Human-Computer Interaction, Ulm University, 2014.
   Reviewers: Prof. G. Palm, Prof. W. Minker.
- Fernando Luis Piñero González. An Algebraic Approach to Graph Codes, Technical University of Denmark, 2014.
   Reviewers: Prof. T. Høholdt, Prof. M. Bossert.
- Mathis Seidl. Polar Coding Finite Length Aspects/Aspekte von Polar Coding mit endlichen Blocklängen, University of Erlangen-Nürnberg, 2015.
   Reviewers: Prof. J. Huber, Prof. M. Bossert.
- Thi My Chinh Chu. On the Performance Assessment of Advanced Cognitive Radio Networks, Department of Communication Systems, Blekinge Institute of Technology (BTH), Karlskrona, Sweden, 2015.
   Chairperson: Prof. H. L. Zepernick, Opponent: Prof. T. Wysocki, Member of the

Chairperson: Prof. H.-J. Zepernick, Opponent: Prof. T. Wysocki, Member of the grading commitee: Prof. Ha H. Nguyen, Associate Prof. E. Uhlemann, Dr. rer. nat. W. Teich.

## 9.1 Diploma Theses

- Michael Scholz. Anwendung von Emotionserkennung in IVR-Systemen auf Mensch-Mensch-Dialoge. Diploma thesis, Supervisor: Stefan Ultes; Reviewer: Prof. H. P. Großmann, Apr. 2014.
- [2] Hannes Stahl. *Compressive Sensing für luftgestützte Radaranwendungen*. Diploma thesis, Supervisor: Dr. J. Mietzner, Airbus Ulm; Reviewer: Prof. R. Fischer, Sep. 2015.

## 9.2 Master Theses

- [1] Kevin Anbuhl. Adaptive Audiokompression für Sprachkommunikation in mobilen Ad-hoc-Netzwerken. Master's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. H. P. Großmann, Jan. 2014.
- [2] Maurus Birk. Zuverlässige Audioübertragung in mobilen Ad-hoc-Netzwerken. Master's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. H. P. Großmann, Jan. 2014.
- [3] Pengfei Cao. Power-Space Profile Estimation in Noncoherent Massive MIMO. Master's thesis, Supervisor: George Yammine; Reviewer: Prof. R. Fischer, Dec. 2015.
- [4] Tao Ding. Alamouti Coding and Decoding Scheme in Filter Bank based Multicarrier System. Master's thesis, Supervisor: Dr.-Ing. Zhao Zhao, Huawei European Research Center (ERC) Munich; Reviewer: Prof. M. Bossert, Mar. 2015.
- [5] Sameh Eldessoki. Peak-to-Average-Power Reduction for FBMC-based MIMO Systems. Master's thesis, Supervisor: J. Dommel, HHI Berlin; Reviewer: Prof. R. Fischer, Aug. 2015.
- [6] Ahmed Moheeb Emara. Decoding Complex Reed-Solomon Codes Beyond Half the Minimum Distance. Master's thesis, Supervisor: Mostafa Hosni Mohamed; Reviewer: Prof. M. Bossert, Apr. 2015.
- [7] Shayan Hassanpourmatikolaei. Assessment of Lattice-Reduction-Aided Precoding for Fiber-Optic Transmission Systems. Master's thesis, Supervisors: Florian Wäckerle and Prof. R. Fischer; Reviewer: Prof. R. Fischer, Oct. 2014.

- [8] Manuel Heiß. Evaluation smarter Broadcastprotokolle für MANETs. Master's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. H. P. Großmann, Dec. 2015.
- [9] Shahriar Hussain. Implementation of Secure Linear Network Coding. Master's thesis, Supervisors: Dr. Vahid Forutan; Reviewer: Prof. R. Fischer, Jan. 2015.
- [10] Mennatallah Ibrahim. Equalization for Fiber-Optic Transmission Systems using Digital Signal Processing. Master's thesis, Supervisor: Dr. rer. nat. Werner Teich; Reviewer: Prof. R. Fischer, Mar. 2015.
- [11] Karim Abdalla Farag Ishak. Code-Based Cryptosystems using Concatenated Structures. Master's thesis, Supervisors: Sven Müelich and Sven Puchinger; Reviewer: Prof. M. Bossert, June 2015.
- [12] Jakob Landesberger. Konzeption und Evaluisierung von lexikalischer und syntaktischer Adaption bei Sprachdialogen mit einem Fahrzeug. Master's thesis, Supervisor: Ute Ehrlich, Daimler AG Ulm; Reviewer: Prof. W. Minker, Dec. 2015.
- [13] Thomas Leichtle. Utilization of Sparsity Awareness in the Simplex Algorithm. Master's thesis, Supervisor: Henning Zörlein; Reviewer: Prof. M. Bossert, June 2014.
- [14] Mostafa Khalili Marandi. Cycle-Slip-Robust Fiber-Optic Communications Using Rotationally Invariant Codes. Master's thesis, Supervisor: Florian Wäckerle; Reviewer: Prof. R. Fischer, July 2014.
- [15] Juliana Miehle. IQ-adaptive Statistical Dialogue Management using Gaussian Processes. Master's thesis, Supervisor: Stefan Ultes; Reviewer: Prof. W. Minker, Oct. 2015.
- [16] David Mödinger. Decoding of Gabidulin Codes using Module Minimisation. Master's thesis, Supervisors: Sven Müelich and Sven Puchinger; Reviewer: Prof. M. Bossert, May 2015.
- [17] Hans Nienhaus. *Development of a Speech Dialog System for China*. Master's thesis, Supervisors: Ute Ehrlich and Ilona Nothelfer, Daimler AG Ulm; Reviewer: Prof. W. Minker, Dec. 2014.
- [18] Reza Pourghorbani. *Towards Multimodal Emotion Recognition*. Master's thesis, Supervisor: Maxim Sidorov; Reviewer: Prof. W. Minker, Mar. 2015.
- [19] Louisa Pragst. Multimodal Adaptive Dialogue Management in OwlSpeak. Master's thesis, Supervisor: Stefan Ultes; Reviewer: Prof. W. Minker, Oct. 2015.
- [20] Muhammad Shan Ur Rehman. Feature selection and feature transformation methods for natural language call routing. Master's thesis, Supervisor: Dr. Roman Sergienko; Reviewer: Prof. W. Minker, July 2015.
- [21] Shrief Rizkalla. Reed-Solomon Codes over the Complex Field Connection to Compressed Sensing. Master's thesis, Supervisors: Mostafa Hosni Mohamed and Henning Zörlein; Reviewer: Prof. M. Bossert, Apr. 2014.

- [22] Alexander Sauer. Prioritätsbasierte Datenverteilung in mobilen Ad-hoc-Netzwerken. Master's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. W. Minker, Oct. 2014.
- [23] Tobias Schmidke. *Interaktive Handlungsplanung*. Master's thesis, Supervisor: Florian Nothdurft; Reviewer: Prof. W. Minker, Nov. 2014.
- [24] Usman Shamim. Performance Evaluation of OFDM-IDMA for Channels with Carrier Frequency Offsets. Master's thesis, Supervisor: Dr. rer. nat. Werner Teich; Reviewer: Prof. R. Fischer, Jan. 2015.
- [25] Bernd Steinle. Analyse der Möglichkeiten und Grenzen serieller Datenübertragung von Datenraten jenseits 10 Gbps auf Leiterkarten in Mobilfunk-Basisstationen. Master's thesis, Supervisor K.-D. Tiepermann, NSN Ulm; Reviewer: Prof. R. Fischer, Feb. 2014.
- [26] María Platero Sánchez. Analysis of an Extended Data Set for Interaction Quality Recognition. Master's thesis, Supervisor: Stefan Ultes; Reviewer: Prof. W. Minker, Sep. 2014.
- [27] Prachi Vaishnav. Evaluation of Digital Adaptive Beamforming. Master's thesis, Supervisor: Peter Ahlemann, Airbus Defence and Space Ulm; Reviewer: Prof. W. Minker, Nov. 2015.
- [28] Yeicatl Ramos Vazquez. *Multi-Stream Precoding for the Wireless Backhaul*. Master's thesis, Supervisor: Sebastian Stern; Reviewer: Prof. R. Fischer, Nov. 2015.
- [29] Patrizia Di Campli San Vito. User Evaluation of User-adaptive Dialogue. Master's thesis, Supervisor: Stefan Ultes; Reviewer: Prof. W. Minker, Oct. 2015.
- [30] Dimitri Wolf. NFC gestützte Indoor Positionierung von Mobilgeräten mittels "Time of flight" Messungen. Master's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. W. Minker, Sep. 2014.
- [31] George Yammine. A Comparison of Noncoherent Receivers Based on Different Modulation Schemes. Master's thesis, Supervisor: Eva Peiker; Reviewer: Prof. R. Fischer, May 2014.

#### 9.3 Bachelor Theses

- Joao Carneiro. Network enabled universal IR remote control for home entertainment systems. Bachelor's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. H. P. Großmann, Apr. 2015.
- [2] Marco Falke. *Efficient Sphere Decoding*. Bachelor's thesis, Supervisor: Susanne Sparrer; Reviewer: Prof. R. Fischer, Feb. 2014.

- [3] Matthias Kraus. Creation of User-Adaptive Dialogue for User Simulator Evaluation. Bachelor's thesis, Supervisor: Stefan Ultes; Reviewer: Prof. W. Minker, June 2014.
- [4] Holger Mandry. Multicastbasierte Audiokommunikation in mobilen Ad-Hoc Netzwerken. Bachelor's thesis, Supervisor: Florian Pregizer; Reviewer: Prof. H. P. Großmann, Nov. 2015.
- [5] Benedikt Meinecke. *Schätzung der Kanalstatistik in "Massive MIMO"*. Bachelor's thesis, Supervisor and Reviewer: Prof. R. Fischer, Apr. 2015.
- [6] Mohamed Naim. Peak-to-Average Power Ratio Reduction via Partial Transmit Sequence for Tomlinson-Harashima Precoding in Multi-User MIMO-OFDM. Bachelor's thesis, Supervisor: Sebastian Stern; Reviewer: Prof. R. Fischer, July 2015.
- [7] Frederik Walter. Power Decoding of Reed-Solomon Codes Using Module Minimisation. Bachelor's thesis, Supervisors: Sven Puchinger and Dr. Johan S.R. Nielsen; Reviewer: Prof. M. Bossert, Apr. 2014.
- [8] Thomas Alexander Westphal. *Channel Estimation in Massive MIMO*. Bachelor's thesis, Supervisor: George Yammine; Reviewer: Prof. R. Fischer, Oct. 2015.

# **10** Conferences and Meetings

The following conferences and meetings were organized and/or hosted by members of our institute:

- ITG-Fachausschuss 5.1 Informations- und Systemtheorie March 21, 2014, Ulm University
- DFG Priority Program "InKoMBio" (SPP 1395)
   October 9–10, 2014, Ulm University, Berichtskolloquim
- DFG, Fachkollegium
   March 30–31, 2015, Ulm University
- Meeting BMBF-Verbundprojekt "ADVAntage-Net" June 2, 2015, Ulm University
- KRISTINA Project Meeting
   October 14–16, 2015, Ulm University

# **11** Academics

The members of the institute are active in various committees and at the university self-administration.

#### **Prof. Martin Bossert**

- Member of Leopoldina, Deutsche Akademie der Wissenschaften
- DFG-Fachkollegiat Nachrichtentechnik
- Vice Dean of the Faculty of Engineering, Computer Science, and Psychology (until Sep. 2015)
- Member of Fakultätsrat
- Head of Promotionsausschuss Dr.-Ing.
- Member of Commission VDE Colloquium
- Member of ITG-Fachausschuss 5.1 Informations- und Systemtheorie

#### **Prof. Robert Fischer**

- Dean of Studies (Engineering) of the Faculty of Engineering, Computer Science, and Psychology (since Oct. 2015)
- Program Director of the International Master Course "Communications Technology" (since June 2014)
- Head of the Admission Board for the International Master Course "Communications Technology" (since Sep. 2014)
- Associate Editor IEEE Transactions on Information Theory (until Dec. 2014)
- Member of Studienkommission "Elektrotechnik" (until Sep. 2015)
- Member of Habilitationsausschuss
- Member of kiz-Ausschuss
- Member of Selection Committee for the Argus Award
- Member of ITG-Fachausschuss 5.1 Informations- und Systemtheorie

#### **Prof. Wolfgang Minker**

- Head of Industrial Internship Office
- Member of Admission Board of the joint B.Sc./M.Sc. Programme "Informationssystemtechnik"

#### **Dr. Werner Teich**

- Member of Studienkommission "Informationssystemtechnik"
- Member of Prüfungskommission "Elektrotechnik", "Informationssystemtechnik", and "Communications Technology"
- Member of Admission Boards for the Master Courses "Elektrotechnik", "Informationssystemtechnik", and the International Master Course "Communications Technology"
- Student Advisor "Elektrotechnik", "Informationssystemtechnik", and "Communications Technology"