Activity Report 2011–2013
Institute of Communications Engineering
Prof. Dr.-Ing. Martin Bossert
Prof. Dr.-Ing. Robert Fischer
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Impressum

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Preface

The institute for Communications Engineering was founded in October 2011 by the union of the two former institutes Information Technology and Telecommunications and Applied Information Theory (Siemens donation chair). The new institute provides research and teaching for several courses of study in the area of communications within the faculty of Electrical Engineering and Computer Science of the Ulm University. 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 October 2011 through December 2013.
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Dipl.-Ing. Henning Zörlein
Lecturers

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Dr.-Ing. Dejan Lazich
Dr.-Ing. Klaus Linhard (until 07/12)
Prof. Dr. Max Riederle
Prof. Dr.-Ing. Georg Schmidt
2 Visitors and Visits

Visiting Scholars

- **University of Trieste, Italy**
  Prof. Francesca Vatta 09/2011

- **Siberian Federal University and Siberian State Aerospace University, Krasnoyarsk, Russia**
  Dr. Sergey Sopov 09/2011–06/2012

- **Institute of Mathematical Research / University of Rennes 1, Rennes, France**
  Dr. Pierre Loidreau 01/2012

- **University of Granada, Spain**
  David Griol Barres 08/2012
  Zoraida Callejas Carrión 08/2012

- **Computer Science Laboratory / École Polytechnique, Palaiseau, France**
  Prof. Dr. Daniel Augot 09/2012

- **Haifa University, Haifa, Israel**
  Prof. Alexander Bolshoy 09/2012

- **Siberian Federal University and Siberian State Aerospace University, Krasnoyarsk, Russia**
  Roman Sergienko 10/2012–03/2013

- **Technical University of Denmark, Copenhagen, Denmark**
  Johan Nielsen 11/2012

- **Russian Academy of Sciences, Moscow, Russia**
  Dr. Alexey Frolov 11/2012

- **University of Texas, Austin, USA**
  Dr. Natalia Silberstein 06/2013

Research Stays at other Universities

- **German University Cairo (GUC), Cairo, Egypt**
  Wolfgang Minker, Florian Nothdurft, Tobias Heinroth 11/2011
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- **University of Erlangen–Nürnberg**
  Robert Fischer 02/2012

- **Institute of Mathematical Research / University of Rennes 1, Rennes, France**
  Antonia Wachter-Zeh 03/2012, 09/2012, 03/2013

- **Computer Science Laboratory / École Polytechnique, Palaiseau, France**
  Alexander Zeh 03/2012, 09/2012, 03/2013

- **University of Granada, Spain**
  Wolfgang Minker, Stefan Ultes, Florian Nothdurft, Helmut Lang, Alexander Schmitt 06/2012

- **University of Granada, Spain**
  Wolfgang Minker, Stefan Ultes, Helmut Lang, Alexander Schmitt 11/2012

- **Institute of Information Transmission Problems, Russian Academy of Sciences, Moscow, Russia**
  Antonia Wachter-Zeh, Alexander Zeh 12/2012

- **University of Newcastle, Australia**
  Dr. Werner Teich 12/2012

- **Siberian Federal University and Siberian State Aerospace University, Krasnoyarsk, Russia**
  Wolfgang Minker, Florian Nothdurft, Roman Sergienko, Maxim Sidorov, Sergey Zablotskiy 01/2013

- **University of Tartu, Estonia**
  Wolfgang Minker, Florian Nothdurft 03/2013

- **University of Granada, Spain**
  Wolfgang Minker, Stefan Ultes, Florian Nothdurft 03/2013

- **Shandong University in Jinan, China**
  Martin Bossert 09/2013

- **Siberian Federal University and Siberian State Aerospace University, Krasnoyarsk, Russia**
  Wolfgang Minker, Stefan Ultes, Roman Sergienko, Tatiana Gasanova, Maxim Sidorov, Dmitry Zaykovskiy 09/2013

- **University of Granada, Spain**
  Wolfgang Minker, Stefan Ultes 11/2013
Awards

- **Martin Bossert**
  IEEE Fellow, 2012

- **Robert Fischer, Florian Wäckerle**
  Best Paper Award im Rahmen des International OFDM Workshop 2012
  *Peak-to-Average Power Ratio Reduction in OFDM via Sparse Signals: Transmitter-Side Tone Reservation vs. Receiver-Side Compressed*

- **Reinhard Heckel, Steffen Schober, Martin Bossert**
  Best-Student-Paper WCSB 2012, June 2012
  *Determinative Power and Tolerance to Perturbations in Boolean Networks*

- **Steffen Schober**
  Award of the Ulmer Universitätsgesellschaft e.V. for the most Outstanding Dissertation, July 2012
  *Analysis and Identification of Boolean Networks using Harmonic Analysis*

- **Florian Wäckerle**
  ARGUS Research Award 2012
  *Compressed Sensing for Peak-to-Average Power Ratio Reduction in OFDM*

- **Robert Fischer**
  IEEE Communications Letters Appreciation 2013

- **Christian Senger**
  Award of the Ulmer Universitätsgesellschaft e.V. for the most Outstanding Dissertation, July 2013
  *Generalized Minimum Distance Decoding with Arbitrary Error/Erasure Tradeoff*

- **Martin Bossert**
  Member of Leopoldina, Deutsche Akademie der Wissenschaften, July 2013

- **Sven Puchinger**
  ARGUS Research Award 2013
  *Improved Decoding of Partial Unit Memory Codes Using List Decoding of Reed-Solomon Codes*

- **Sebastian Stern**
  VDE Award for Outstanding Master Thesis 2013
  *Vergleich des Spitzenwertverhaltens von Ein- und Mehrträgerverfahren*
A detailed description of the lectures is available online.

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

**Advanced Topics in Information Theory** (English) Master 2L/1E
Geometry of Signals and Codes; Optimal Error Control Codes; Strong and Weak Simplex Conjecture; The Channel Coding Theorem; Error Exponent and Channel Capacity, Generalized Error Exponent and Channel Capacity

**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 Structures (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
(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
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**Channel Coding** (English)  
Master 3L/2E/1P

- 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** (English)  
Master 4L/2E/2P

- 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; Orthogonal Frequency-Division Multiplexing (OFDM)

**Communication Systems** (English)  
Master 2L/1E

- Mobile Radio Channel; Basics of Mobile Communication Systems; GSM and UMTS

**Compressed Sensing** (German)  
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 Programming
- Sampling by Compressed Sensing; Data Acquisition by Compressed Sensing

**Dialogue Systems** (German)  
Master 2L/2E

- 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

**Einführung in die Nachrichtentechnik** (German)  
Bachelor 3L/2E/2P

(Introduction to Communication Engineering)

- History and Milestones of Communications; Models in Communications; Shannon’s Uncertainty and Source Coding; Signals for Transmission of Information Channels; Decision Theory; Error Probability; Channel Coding Theorem; Error Correcting Codes; Reliable Data Transmission; Multiple Access; Routing; Security
**Embedded Security**  (English)  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

**Grenzen der Informationsverarbeitung**  (German)  Master  2L/1E

(Performance Limits of Computation)

Moore’s Law: Past, Present, and Future; Information and Complexity Theory; Thermodynamical Aspects to Limits of Computation; Computation as a Communication Problem; Interpretation of the Channel Coding Theorem; Genetic Code and Molecular Computing; Basics of Quantum Computing; Kolmogorov’s Superposition Theorem and Neural Computing

**Information Theory and Biology**  (English)  Master  2L/1E/1P

(Information and System Theory in Life Sciences)

Analysis of Biological Systems using Concepts, Models, and Methods of Information and Systems Theory; Information Transmission in Cells; Information Content of Binding Sites; ORF Length Distributions; Phylogenetic Trees and Compression Distance; Elementary Circuits of Transcription Networks; Boolean Networks; Reconstruction Problems of Boolean Networks

**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

**Signal Processing Algorithms**  (English)  Master 2L/1E

Random Numbers; Spectral Analysis; Coherence Estimation; Digital Filter and Filter Design; Adaptive Filter; Sampling Rate Conversion, Wiener Filter

**Signale und Systeme**  (German)  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)  Master 3L/1E

Concept 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/1P

Hierarchical Structure of Networks; OSI Model; Physical Layer; Framing; ARQ; Multiple Access (Aloha, CSMA, Token, ...); Queuing Theory; Routing (Bellman–Ford, Dijkstra)
5 Research

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 next-generation communications systems. The main focus is on the mathematical and theoretical foundations of communication and signal processing schemes. This includes equalization schemes 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 interdisciplinary 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 2011–2013 the following projects were supported by the German Research Council “Deutsche Forschungsgemeinschaft” (DFG).

- Coding Techniques for Transmitting Packets Through Complex Communication Networks
  Grant: Bo 867/21-1/2 (SPP COIN)

- Assistives und adaptives Dialogmanagement
  Grant: Minker (SFB Transregio 62 TP B01)
  Duration: 72 months, Begin: 2009

- Finding New Overlapping Genes and their Theory (FOG-Theory)
  Grant: Bo 867/23-1/2 (SPP InKoMBio)
  Duration: 60 months, Begin: January 2010

- The Evolutive Adaptation of the Transcriptional Information Transmission in E.Coli
  Grant: Bo 867/25-1/2 (SPP InKomBio)
  Duration: 48 months, Begin: January 2010

- Coordination Project InKoMBio
  Grant: Bo 867/31-1
  Duration: 60 months, Begin: January 2010

- Codierung, Modulation und Detektion für leistungseffiziente aufwandsgünstige Impulse-Radio Ultra-Wideband Übertragungssysteme
  Grant: Fi 982/3-2 (SPP UKoLoS, cooperation with Prof. Huber)
  Duration: 24 months, Begin: July 2010, End: July 2012

- Intra-Corporal Localization and Communications using UWB
  Grant: Li 659/11-1 (SPP UKoLoS, cooperation with Prof. Schumacher)
  Duration: 24 months, Begin: June 2011, End: May 2013

- Effiziente Ausnutzung des Spektrums durch Einsatz kognitiver Overlay-Techniken in Mehrantennenkommunikationssystemen
  Grant: HU 1835/3-1
  Duration: 24 months, Begin: April 2011, End: April 2013

- Methoden der Kanalcodierung für Compressed Sensing
  Grant: Bo 867/27-1
  Duration: 36 months, Begin: May 2011

- Nichtkohärente Übertragungsverfahren für MIMO-kanäle und deren Erweiterung auf drahtlose Netze mit Relaisstationen

\(^1\)SPP: “Schwerpunktprogramm” (priority project); SFB: “Sonderforschungsbereich” (SFB).
Grant: Li 658/13-1 (cooperation with Profs. Sezgin and Utkovski)
Duration: 24 months, Begin: October 2011, End: October 2013

- **Variants of Modulo-Precoding for Cooperative Transmission Strategies and Interference Utilization in Broadcast Channels and Network Coding**
  Grant: Fi 982/4-2 (SPP COIN, cooperation with Prof. Huber)
  Duration: 24 months, Begin: October 2011, End: October 2013

- **Decoding in Weighted Combinatorial and Other Metrics**
  Grant: Bo 867/28-1
  Duration: 24 months, Begin: June 2012

- **Analoge Signalverarbeitung: Algorithmen — Strukturen — elektronische Schaltungen** (cooperation with Prof. Schumacher)
  Grant: Li 659/12-1
  Duration: 24 months, Begin: January 2011

- **Interrelations between Channel Coding and Precoding in Transmission Strategies for Broadcast Channels and in Network Coding** (cooperation with Profs. Fischer and Huber)
  Grant: Bo 867/29-3 (SPP COIN)
  Duration: 24 months, Begin: November 2013

- **Interrelations between Channel Coding and Precoding in Transmission Strategies for Broadcast Channels and in Network Coding** (cooperation with Profs. Bossert and Huber)
  Grant: Fi 982/4-3 (SPP COIN)
  Duration: 24 months, Begin: November 2013

- **Analyse der Informationsverarbeitung in molekularen Netzwerken mithilfe der Kommunikationstheorie diskreter Prozesse**
  Grant: SCHO 1576/1-1 (SPP InKoMBio)
  Duration: 18 months, Begin: January 2014

- **DFG Priority Program (SPP) InKoMBio** (Homepage: [www.inkombio.de](http://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 hel-
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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.

Reinhart Koselleck Project

The purpose of Reinhart Koselleck projects is to enable outstanding researchers with a proven scientific track record to pursue exceptionally innovative or higherrisk projects.

It is founded for researchers who hold or are eligible to hold professorships, especially at universities, and who have an outstanding curriculum vitae and great scientific potential. The project requirements are exceptionally innovative or higherrisk projects that cannot be funded within the scope of other DFG programmes or within the framework of the applicant’s own institution.

Prof. M. Bossert applied for a project in the Reinhart Koselleck program with the title “Decoding of algebraic codes beyond half the minimum distance and list-decoding”. The application was approved in 08/2009.

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

Grant: 16BP12406 (R. Fischer)

Duration: 54 man-months, Begin: August 2012
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**

**Books and Book Chapters**


**Journal and Conference Papers**


[27] Wenhui Li, Vladimir R. Sidorenko, Di Chen. On transform-domain decoding of


Publications by Prof. Fischer’s Group

Books and Book Chapters


Journal and Conference Papers


Publications by Prof. Lindner’s Group

Books and Book Chapters


Journal and Conference Papers

[1] Nardine Farah, Eva Peiker-Feil, Werner G. Teich, Jürgen Lindner. Comparison of CDD and MC-CAFS for the MIMO-OFDM DL in LTE. In IC 1004 4th MC and


[9] Eva Peiker-Feil, Matthias Wetz, Werner G. Teich. OFDM-MFSK as a Special Case of Noncoherent Communication Based on Subspaces. In IC 1004 5th MC and Scientific Meeting, TD(12)05017, Bristol, Great Britain, September 2012.


[12] Thanawat Thiasiriphet, Jürgen Lindner, Mohamed Ibrahim. Compressed Sensing

Publications by Prof. Minkers’s Group

Books and Book Chapters


Journal and Conference Papers


[40] Stefan Ultes, Robert ElChabb, Alexander Schmitt, Wolfgang Minker. JACHMM: A JAVA-BASED CONDITIONED HIDDEN MARKOV MODEL LIBRARY. In IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),


Prof. Dr. Sergei Fedorenko. *The DFT with reduced multiplicative complexity*, October 27, 2011


Johana Cardenas. *Investigation of continuous-time recurrent neural networks as vector equalizer*, December 5, 2011

Harris Hafeez. *On Algorithms Decoding Reed-Solomon Codes Beyond Half the Minimum Distance*, December 19, 2011


Florian Hock. *Comparison of some Algorithms for GMD Decoding of Reed-Solomon Codes*, January 16, 2012

Prof. Pierre Loidreau. *A public-key cryptosystem based on the problem of reconstructing \( q \)-polynomials*, January 23, 2012


Prof. Dr. ir. Jos H. Weber (Delft University of Technology, The Netherlands). *Extensions of Knuth’s Balanced Coding Scheme*, March 5, 2012


Salma Hesham Badreldin. *Syndrome based interpolation for Reed-Solomon list*
Mostafa Hosni Mohamed. *Construction and Decoding of Rank-Metric Based Multi-Memory Codes*, April 2, 2012


Mohamed Ibrahim. *Compressive Sensing for Ultra Wideband Channel Estimation*, June 18, 2012


Georg Fischer. *Decoding Techniques for interleaved generalized Reed-Solomon Codes*, June 29, 2012


Mina Shehata. *Concatenated Compressed Sensing based Error Correcting Codes*, July 9, 2012


Frank Dangel. *Zweikanalige Verfahren zur Sprachsignalverbesserung für Mobilgeräte*, July 16, 2012

Sven Puchinger. *Improved Decoding of Partial Unit Memory Codes Using List Decoding of Reed-Solomon Codes*, July 20, 2012

Sherif Mohamed. *Investigation of high-order recurrent neural networks as continuous decoder*, July 24, 2012


Thomas Jerkovits. *Comparison of Bounds on the Minimum Distance of Cyclic Codes*, September 10, 2012

Di Chen. *On fast software decoding of interleaved Gabidulin codes*, September 17, 2012

Prof. Alexander Bolshoy (University of Haifa, Israel), Tatiana Tatarinova (University of Glamorgan, Wales, UK). *Revealing Factors Affecting Gene Length-Review of applicable methods of combinatorial optimization*, September 24, 2012

Stefano Rini (TU Munich). *A Reference Based Genomic Compression Algorithm*, October 9, 2012

Alexander Schneider. *Sendestrategien im kognitiven MIMO-Funkkanal mit einem nicht adaptiven Primärsystem*, October 22, 2012

Johan Nielsen (Danmarks Tekniske Universitet). *The Wu list-decoder for Generalized Reed-Solomon codes using the Euclidean Algorithm*, November 12, 2012


Prof. Frank Kschischang (University of Toronto). *Staircase Codes*, November 29, 2012


Gero Viertel. *Reed Muller Codes for Compressed Sensing*, December 17, 2012


Martin Schießl. *MEMS Mikrofon Arrays für Freisprechen*, February 18, 2013

Dr. Alex Alvarado (Marie Curie Fellow, University of Cambridge). *High-SNR Asymptotics of Mutual Information for Discrete Constellations with Applications to BICM*, May 6, 2013


Johannes Klotz. *Computing Preimages of Boolean Networks using the well known Sum-Product Algorithm*, June 3, 2013

Dr. Vahid Forutan. *Cooperative Relaying Techniques For Traffic Transfer In Wireless Sensor Networks*, June 12, 2013

Dung Pham. *Deterministic Sensing Matrices Based on Algebraic Curves*, June 17, 2013

Kotchapol Yoosooksawat. *Reconstruction Algorithms for Sensing Matrices Based on Cyclic Codes*, June 24, 2013


Natalia Silberstein, Ph.D. (University of Texas, Austin, USA). *Codes for distributed storage systems via rank-metric codes*, June 26, 2013


Michael Walter (DLR, Oberpfaffenhofen). *Scattering in time-variant mobile-to-mobile communication channels*, October 7, 2013


Markus Ulmschneider. *Nonbinary Small-Minimum-Distance Cyclic Codes for Bounding the Minimum Distance of Cyclic Codes*, October 11, 2013

Mahmoud Almarashli. *Barcodes Based on Watermarks for Indel Correction*, October 17, 2013


Thomas Morawetz. *Niedrigenergie-Datenübertragung am Beispiel einer Temperaturerfassung*, December 06, 2013
Prof. Elena Fimmel, Prof. Markus Gumbel and Prof. Lutz Strüngmann (Faculty of Computer Science, Mannheim University of Applied Sciences). *The Binary Dichotomic Algorithm (BDA) and BDA-generated Models of the Genetic Code*, December 09, 2013


8 Ph.D. Theses

8.1 Supervised Ph.D. Theses

- Sabine Kampf. Decoding Hermitian Codes — An Engineering Approach, Institute of Communications Engineering, Ulm University, 2011. Reviewers: Prof. M. Bossert, Prof. K. Dietmayer, Ulm University.

- Christian Senger. Generalized Minimum Distance Decoding with Arbitrary Error/Erasure Tradeoff, Institute of Communications Engineering, Ulm University, 2011. Reviewers: Prof. M. Bossert, Prof. F.R. Kschischang, PhD, University of Toronto.

- Tobias Herbig. Self-Learning Speaker Identification for Enhanced Speech Recognition, Institute of Communications Engineering, Ulm University, 2011. Reviewers: Prof. W. Minker, Prof. R. Häb-Umbach, University of Paderborn.

- Daniel Vasquez. Hierarchical Neural Network Structures for Modeling Inter and Intra Phonetic Information for Phoneme Recognition, Institute of Communications Engineering, Ulm University, 2011. Reviewers: Prof. W. Minker, Prof. G. Palm, Ulm University.


- Olaf Schreiner. Automatic Speech Recognition Using Large Word Lists For Voice User Interfaces, Institute of Communications Engineering, Ulm University, 2011. Reviewers: Prof. W. Minker, Prof. G. Palm, Ulm University.


Antonia Wachter-Zeh. Decoding of Block and Convolutional Codes in Rank Metric, Institute of Communications Engineering, Ulm University, 2013. Reviewers: Prof. M. Bossert, Prof. T. Høholdt, Technical University of Denmark.

Frederic Knabe. Transmit Strategies for MIMO Multi-User Channels with AF-Relay, Institute of Communications Engineering, Ulm University, 2013. Reviewers: Prof. M. Bossert, Dr. D. Gündüz, Imperial College London.


Mohammed Khider. Multisensor-Based Positioning for Pedestrian Navigation, Institute of Communications Engineering, Ulm University, 2013. Reviewers: Prof. J. Lindner, Prof. U.-C. Fiebig, DLR Oberpfaffenhofen, and Prof. R. Schober, University of Erlangen-Nürnberg.
8.2 Co-Supervised Ph.D. Theses


- Yun Chen. *Automatic Modulation Classification in Mobile OFDM Systems*, University of Duisburg-Essen, 2013. Reviewers: Prof. A. Czylik, Prof. R. Fischer


- Hung Tran. *Performance Analysis of Cognitive Radio Networks with Interference Constraints*, School of Computing, Blekinge Institute of Technology (BTH), Karlskrona, Sweden, 2013. Chairperson: Prof. H.-J. Zepernick, Opponent: Prof. T. Wysocki, Member of the grading committee: Prof. Z. Hadzi-Velkov, Dr. rer. nat. W. Teich, Dr. Magnus Nilsson
Institute of Communications Engineering

  Reviewers: Prof. P. Beelen, Prof. T. Høholdt, Prof. M. Bossert.

  Reviewers: Prof. H. Kabza, Prof. W. Minker.

  Reviewers: Prof. P. Pepper, Prof. W. Minker.

- David Hrabal. *Emotion Classification in Human-Computer Interaction on the Basis of Physiological Data*, Ulm University, 2013.
  Reviewers: Prof. H. Traue, Prof. W. Minker.

### 8.3 Co-Supervised Habilitations

  Reviewers: Prof. C. Ruland, Prof. M. Bossert
9 Theses

9.1 Diploma Theses


9.2 Master Theses


### 9.3 Bachelor Theses


### 9.4 Student Research Projects (Studienarbeiten)


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

- **9th International Workshop on Computational Systems Biology (WSCB 2012)**
  June 4.–6., 2012, Ulm, Germany
  The workshop should bring together researchers from biology and information theory for discussions. The workshops accompanies the DFG priority program InKoMBio (SPP 1397). Well known international researchers from both fields are invited speakers.

- **DFG Priority Program “InKoMBio” (SPP 1395)**
  Oct. 18.–19., 2012, FRIAS Freiburg University, Berichtskolloquium InKoMBio (SPP 1395/2)
  Oct. 14., 2013, Ulm University, Antragskolloquium InKoMBio (SPP 1395/3)
  These meetings have been coordinated for the DFG Priority Program “InKoMBio” (SPP 1395). The meeting at Freiburg University have been jointly organized with Prof. Backofen and Prof. Palme (Freiburg).

- **ITG-Fachgruppe “Bioinformations Theorie”**
  Apr. 17.–19., 2013, Martin Luther University of Halle-Wittenberg, Workshop: “Gene Regulation and Information Theory”
  The workshop has been jointly organized with Prof. Große and Prof. Breunig, University of Halle-Wittenberg. Further information are available online.

- **ITG-Fachgruppe “Angewandte Informationstheorie”**
  Oct. 08., 2013, Ulm University, focus: “Channel Coding and Compressed Sensing”
  The workshop has been jointly organized with Dr. Wübben, University Bremen. Further information are available online.

- **Status Meeting “ADVantage-Net”**
  Oct. 23., 2013, Ulm University
  The meeting has been jointly organized with Dr. Eiselt, ADVA Optical Networking, Meiningen.
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
- Member of Board of Governors IEEE Information Theory Society
- DFG-Fachkollegiat Nachrichtentechnik
- Vice Dean of the Faculty of Engineering and Computer Science
- Member of Fakultätsrat
- Member of Commission for Student Affairs
- Head of Promotionsausschuss Dr.-Ing.
- Head of Habilitationsausschuss
- Head of Verein zur Förderung mathematisch begabter Jugendlicher
- Member of Commission VDE Colloquium
- Member of ITG-Fachausschuss 5.1 Informations- und Systemtheorie

Prof. Robert Fischer
- Associate Editor IEEE Transactions on Information Theory
- Associate Editor International Journal of Electronics and Communications (AEÜ)
- Member of Studienkommission “Elektrotechnik”
- Member of Admission Board for the International Master Course “Communications Technology”
- Member of Habilitationsausschuss
- Member of Selection Commitee 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 “Informationsystemtechnik”
- Member of GUC Advisory Board

Prof. Jürgen Lindner
- Member of Board of Trustees of the Eduard Rhein Foundation

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”

Ulrike Stier
- Member of Fakultätsrat