

Curriculum Vitae of Julia Lieb

Personal Data

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ORCID: 0000-0003-4211-1596

Date of Birth: 7. January, 1988

Place of Birth: Kronach, Germany

Nationality: German

Keywords of research interests

- Convolutional codes
- Construction of codes from combinatorial objects (like designs or Latin squares)
- Code-based cryptography
- Polynomial matrices and counting problems over finite fields
- Linear systems over finite fields

Professional experience

09/2020 - PostDoctoral Researcher at the University of Zurich (in Applied Algebra group)

04/2021 - 08/2021 Substitute Assistant Professor for Discrete Mathematics at the University of Passau, Germany

09/2018 - 08/2020 DFG research fellowship at the University of Aveiro/Portugal (until 08/2019) and the University of Zurich (from 09/2019), topic of the research project:
„Construction and decoding of convolutional codes over the erasure channel“

09/2017 - 08/2018 Postdoc at the Institute of Mathematics at the University of Würzburg, research project:
„Construction and decoding of convolutional codes over the erasure channel“
(funded by SCIENTIA Postdoc scholarship)

01/2017 - 08/2017 Research Assistant at the Institute of Mathematics at the University of Würzburg

06/2014 - 09/2016 (chair for Dynamical systems and control theory)

10/2016 - 12/2016 Research Assistant at the Institute of Mathematics at the University of Zurich
(chair for Applied Algebra)

10/2010 - 09/2014 Graduate assistant at the Institute of Mathematics at the University of Würzburg

Education

10/2014 – 09/2017 PhD student in mathematics at the University of Würzburg
Degree: Dr. rer. nat. (grade: 1 (very good))
Title of the PhD thesis: „Counting Polynomial Matrices over Finite Fields with Certain Coprimeness Properties and Applications to Linear Systems and Coding Theory“

09/2016 – 12/2016 Visiting PhD student at the Institute of Mathematics at the University of Zurich

10/2012 – 09/2014	Master studies in Mathematics at the University of Würzburg Degree: Master of science (grade: 1,0 (very good)) Thesis title: Prime unzerstörbare Blaschkeprodukte
10/2009 – 03/2012	Bachelor studies in Mathematics at the University of Würzburg Degree: Bachelor of science (grade: 1,0 (very good)) Thesis title: Wiman-Valiron-Theorie
10/2007 - 12/2012	Teaching degree for secondary schools with subjects mathematics and catholic theology at the University of Würzburg (State examination with grade 1,14)

Awards

2007	Success in the test for highly skilled high-school graduates of Bavaria and admission to the „Max-Weber-Programme Bavaria“
2007	Admission to the Elite Network of Bavaria
2012	Best state examination for teaching degree for secondary schools in the fall of 2012
2014	Award of Otto-Volk for my master degree with grade 1,0
2015	Admission to the programme „Mentoring in science“ of the University of Würzburg

Scholarships and Grants

09/2017-08/2018	SCIENTIA Postdoc scholarship of the University of Würzburg
09/2018-08/2020	DFG research scholarship DAAD P.R.I.M.E. Fellowship (selection 2017, declined since I decided for the DFG scholarship)
01/2020-	SNF grant (volume CHF 545.000, PI Prof. Rosenthal, I was involved in the application)
09/2022-04/2023	Forschungskredit Postdoc at the University of Zürich

Presentations and Conferences

Invited talks

04/2016	<i>Probability Estimations for Networks of Linear Systems and their Correlation with Interconnected Convolutional Codes</i> University of Zurich
03/2017	<i>Probability estimates for networks of linear systems and convolutional codes</i> University of Aveiro (Portugal)
10/2017	<i>Construction of MDP convolutional codes</i> University of Neuenburg (Switzerland)
01/2018	<i>Construction of MDP convolutional codes</i> TU Munich
02/2018	<i>MDP Faltungscodes</i> University of Konstanz (Germany)
01/2019	<i>The Connection between Discrete-Time Linear systems and Convolutional Codes</i> University of Würzburg (Germany)

- 06/2019** *The problem of constructing complete MDP convolutional codes over small fields*
University of Alicante (Spain)
- 05/2021** *Convolutional codes*
University of Passau (Germany)
- 03/2022** *Data transmission with convolutional codes*
University of Bern
- 10/2022** *Data transmission with convolutional codes*
TU Kaiserslautern (Germany)
- 11/2022** *The relationship between non-catastrophicity and other properties of convolutional codes*
University of Aveiro (Portugal)

Talks and poster presentations on conferences

- 09/2014** *Reachability of Random Linear Systems over Finite Fields (talk)*
Fourth International Castle Meeting on Coding Theory and Applications (4ICTMA)
at Castle of Palmela, Portugal
- 02/2015** *What is the probability that a parallel connection is reachable? (poster)*
Oberwolfach Workshop Control Theory:
A Mathematical Perspective on Cyber-Physical Systems
- 06/2015** *Probability of Reachability for networks of linear Systems over Finite Fields (talk)*
7th Workshop on Coding and Systems, Salamanca (Spain)
- 08/2016** *Probability Estimations for Linear Systems and Convolutional Codes (talk)*
Dagstuhl Seminar "Coding Theory in the Time of Big Data"
- 03/2017** *Probability estimates for networks of linear systems over finite fields and Applications to convolutional codes (talk)*
Workshop on Networks of Linear Systems and Operator Theory, Sde Boker, Israel
- 07/2017** *Probability Estimates for Linear Systems and Convolutional Codes (poster)*
Munich Workshop on Coding and Applications (MCA 2017)
- 04/2018** *MDP Convolutional Codes (poster)*
Munich Workshop on Coding and Cryptography (MWCC 2018)
- 12/2018** *The problem of constructing (complete) MDP convolutional codes over small fields (talk)*
Dagstuhl Seminar "Algebraic Coding Theory for Networks, Storage, and Security"
- 07/2019** *MDP convolutional codes (talk),*
SIAM Conference on Applied Algebraic Geometry, Bern
- 07/2019** *Construction of Complete MDP convolutional codes (poster)*
Munich Workshop on Coding and Cryptography (MWCC 2019)
- 07/2021** *Construction of LDPC convolutional codes (online talk)*
National Meeting of the Portuguese Society for Mathematics (ENSPM 2021)
- 07/2022** *Erasure decoding of convolutional codes with the help of linear systems (talk)*
Coding theory and cryptography, A conference in honor of Joachim Rosenthal's 60th birthday,
Zurich

Invited session organization

- 09/2022** *Algebraic Theory of Block and Convolutional Codes*
25th International Symposium on Mathematical Theory of Networks and Systems (MTNS 2022),
Bayreuth, Germany

Attended conferences

03/2019	Oberwolfach Workshop <i>Contemporary Coding Theory</i>
06/2020	IEEE International Symposium on Information Theory (ISIT 2020) <i>virtual conference</i>
07/2020	International Workshop on the Arithmetic of Finite Fields (WAIFI 2020) <i>virtual conference</i>
03/2021	International Workshop on Cryptography and Coding Theory (IWCC 2021) <i>virtual conference</i>
06/2021	Algebraic Coding Theory e-Summer School (ACT 2021)
06/2021	CBCrypto (CBC 2021) <i>virtual conference</i>
03/2022	The Twelfth International Workshop on Coding and Cryptography (WCC 2022) <i>virtual conference</i>
04/2022	Algebraic Methods in Coding Theory and Communication <i>virtual conference</i>
07/2022	Algebraic Coding Theory Summer School (ACT 2022), Zurich
07/2022	Contemporary Algebraic and Geometric techniques in Coding Theory and Cryptography <i>virtual summer school</i>

Community service

- Reviewer for „Journal of Algebra and its Applications”
- Reviewer for „Linear Algebra and its Applications”
- Reviewer for „Designs, Codes and Cryptography“
- Reviewer for „Finite Fields and their Applications“
- Reviewer for „IEEE Transactions on Information Theory“
- Reviewer for „IEEE Transactions on Communications“

List of publications of Julia Lieb

Journal papers (peer reviewed)

- (1) Helmke, U.; Jordan, J.; Lieb, J.: Probability estimates for reachability of linear systems defined over finite fields, *Advances in Mathematics of Communications* 10 No. 1 (2016), p. 63-78.
- (2) Lieb, J.: The probability of primeness for specially structured polynomial matrices over finite fields with applications to linear systems and convolutional codes, *Math. Control Signals Syst.* 29:8 (2017), doi:10.1007/s00498-017-0191-z.
- (3) Lieb, J.: Uniform probability and natural density of mutually left coprime polynomial matrices over finite fields, *Lin. Alg. Appl.* 539 (2018), p. 134-159.
- (4) Lieb, J.: Complete MDP convolutional codes, *Journal of Algebra and Its Applications* 8:6 (2019) 1950105 (13 pages).
- (5) Lieb, J.: Necessary field size and probability for MDP and complete MDP convolutional codes, *Des. Codes Cryptogr.* 87:12 (2019), p. 3019-3043.
- (6) Lieb, J.; Pinto, R.: Constructions of MDS convolutional codes using superregular matrices, *J. Algebra Comb. Discrete Appl.* 7:1 (2020), p. 71-82.
- (7) Almeida, P.; Lieb, J.: Complete j-MDP convolutional codes, *IEEE Transactions on Information Theory*, doi: 10.1109/TIT.2020.3015698, 2020.
- (8) Alfarano, G. N.; Lieb, J.: On the left primeness of some polynomial matrices with applications to convolutional codes, *Journal of Algebra and Its Applications*, doi: 10.1142/S0219498821502078, 2020.
- (9) Lieb, J.; Napp, D.; Pinto, R.: List decoding of Convolutional Codes over integer residue rings, *Finite Fields and Their Applications* 72 (2021), 101815.
- (10) Lieb, J.; Rosenthal, J.: Erasure decoding of convolutional codes using first-order representations, *Math. Control Signals Syst.* 33:3 (2021), p. 499-513, doi: 10.1007/s00498-021-00289-9.
- (11) Alfarano, G. N.; Lieb, J.; Rosenthal, J.: Construction of LDPC convolutional codes via difference triangle sets, *Designs, Codes and Cryptography* 89 (2021), p. 2235-2254.
- (12) Lieb, J.; Pinto, R.: A decoding algorithm for 2D convolutional codes over the erasure channel, *Advances in Mathematics of Communications*, doi.org/10.3934/amc.2021031, 2021.
- (13) Alfarano, G. N.; Gruica, A.; Lieb, J.; Rosenthal, J.: Convolutional codes over finite chain rings, MDP codes and their characterization, *Advances in Mathematics of Communications*, doi: 10.3934/amc.2022028, 2022.

Chapters of books (peer reviewed)

- (1) Lieb, J.; Pinto, R.; Rosenthal, J.: Convolutional Codes, in *Concise Encyclopedia of Coding Theory* (eds. Huffman, C; Kim, J.; Sole, P), CRC Press, 2021.

Conference proceedings (peer reviewed)

- (1) Helmke, U.; Jordan, J.; Lieb, J.: Reachability of random linear systems over finite fields, in *Coding Theory and Applications, 4th International castle Meeting, Palmela Castle, Portugal* (eds. Pinto, R.; Malonek, P.R.; Vettori, P), Springer-Verlag (2014), p. 217-225.
- (2) Alfarano, G. N.; Lieb, J.; Rosenthal, J.: Construction of rate $(n-1)/n$ non-binary LDPC convolutional codes via difference triangle sets, *IEEE International Symposium on Information Theory (ISIT)*, 2020.
- (3) Lieb, J.; Tinani, S.: A Number Theoretic Approach to Cycles in LDPC Codes, *IFAC-PapersOnLine*, Volume 55, Issue 30, 2022, Pages 67-72, doi:10.1016/j.ifacol.2022.11.030.
- (4) Chimal-Dzul, H.; Lieb, J.; Rosenthal, J.: Generator Matrices of Quasi-cyclic Codes over Extension Fields Obtained from Gröbner Basis, *IFAC-PapersOnLine*, Volume 55, Issue 30, 2022, Pages 61-66, doi:10.1016/j.ifacol.2022.11.029.

Preprints

- (1) Lieb, J.; Napp, D.; Pinto, R.: Robust low-delay Streaming PIR using convolutional codes, arXiv:1911.01316v2.
- (2) Heri, S.; Lieb, J.; Rosenthal, J.: Self-Dual Convolutional Codes, arXiv:2208.04087.

Dissertation

- (1) Lieb, J.: Counting Polynomial Matrices over Finite Fields. Matrices with Certain Primeness Properties and Applications to Linear Systems and Coding Theory, Würzburg University Press 2017 (available at: <https://opus.bibliothek.uni-wuerzburg.de/frontdoor/index/index/docId/15130>).