

Reinhard Heckel

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University of California, Berkeley
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Research interests

Machine learning, statistical learning theory, signal processing, high-dimensional statistics, sparse signal recovery, compressive sensing.

Education

- 08/2010 - **ETH Zurich**, Zurich, Switzerland.
- 10/2014 Ph.D. in Electrical Engineering
 - Thesis: “Sparse signal processing: Subspace clustering and system identification”
 - Advisor: Prof. Helmut Bölcskei
 - Co-examiners: Prof. Peter Bühlmann (ETH Zurich) and Prof. Holger Boche (TU Munich)
- 09/2013 - **Stanford University**, Stanford, CA, United States.
- 12/2013 Visiting Ph.D. Student with Prof. Emmanuel Candès
- 10/2005 - **University of Ulm**, Ulm, Germany.
- 05/2010 Diploma (equiv. M.S. degree) in Electrical Engineering, **with Honors**
 - Thesis: “Analysis of binary polynomial systems using the Fourier transform”
 - Advisor: Prof. Martin Bossert

Awards and honors

- ETH Zurich medal for outstanding Ph.D. thesis, 2015
- IBM first patent application invention achievement award, 2015
- Early Postdoc.Mobility fellowship from the Swiss National Science Foundation, 2014
- Best student paper award at the Int. Workshop on Comp. Systems Biology, 2012

Academic and industrial appointments

- 01/2016 - **University of California Berkeley**, Berkeley, CA.
 - present Postdoc at the Department of Electrical Engineering and Computer Sciences
 - Working with Prof. Wainwright and Prof. Ramchandran on mathematical signal processing and statistical learning theory
- 12/2014 - **IBM Research**, Zurich, Switzerland.
- 12/2015 Postdoc at the Department of Cognitive Computing & Computational Sciences
 - Research on machine learning
 - Design and implementation of an algorithm currently employed in a recommender system
 - Two patents filed
- 08/2010 - **ETH Zurich**, Zurich, Switzerland.
- 11/2014
 - Research Assistant at the Communication Technology Laboratory
 - Teaching Assistant
 - Harmonic analysis: Theory and applications in advanced signal processing (Spring 2013)
 - Fundamentals of wireless communication (Spring 2011, 2012, and 2014)
 - Signals and systems (Fall 2010 and 2011)
 - Co-supervision of four Master’s thesis and three semester projects

- 11/2006 - **University of Ulm**, Ulm, Germany.
06/2010 Teaching Assistant
◦ Machine oriented software in C (Fall 2007 and 2009)
◦ Lab course “Programming in C++” (Summer 2008)
Student Assistant at the Institute of Telecommunications and Applied Information Theory
- 09/2009 - **Intel**, Guadalajara, Mexico.
10/2009 Intern at the Communications Research Group
◦ Worked on the design and implementation of a 60 GHz equalizer in a single carrier system

Publications

5 representative papers marked with *

Preprints

- *P1 **R. Heckel**, N. B. Shah, K. Ramchandran, and M. J. Wainwright “Active ranking from pairwise comparisons and when parametric assumptions don’t help,” arXiv:1606.08842, submitted to *Annals of Statistics*, 2016.
- P2 **R. Heckel** and M. Soltanolkotabi, “Generalized line spectral estimation via convex optimization,” arXiv:1609.08198, submitted to *IEEE Transactions on Information Theory*, 2016.
- P3 **R. Heckel** and K. Ramchandran, “The sample complexity of online one-class collaborative filtering,” submitted.

Journal articles

- * J1 **R. Heckel**, M. Tschannen, and H. Bölcskei, “Dimensionality-reduced subspace clustering,” *Information and Inference: A Journal of the IMA*, to appear (arXiv:1507.07105, Jul. 2015).
- J2 M. Vlachos, V.G. Vassiliadis, **R. Heckel**, A. Labbi, “Toward interpretable predictive models in B2B recommender systems,” *IBM Journal of Research and Development*, vol. 60, no. 5/6, pp. 11:1-11:12, Sep. 2016.
- * J3 **R. Heckel**, V. I. Morgenshtern, M. Soltanolkotabi, “Super-resolution radar,” *Information and Inference: A Journal of the IMA*, vol. 5, no. 1, pp. 22-75, Mar. 2016.
- * J4 **R. Heckel** and H. Bölcskei, “Robust subspace clustering via thresholding,” *IEEE Transactions on Information Theory*, vol. 61, no. 11, pp. 6320–6342, Nov. 2015.
- J5 D. Paunescu, C. A. Mora, L. Querci, **R. Heckel**, M. Puddu, B. Hattendorf, D. Günther, and R. N. Grass, “Detecting and number counting of single engineered nanoparticles by digital particle polymerase chain reaction,” *ACS Nano*, Aug. 2015, **selected by ACS as Editors Choice**.
- * J6 R. Grass, **R. Heckel**, M. Puddu, D. Paunescu, and W. J. Stark, “Robust chemical preservation of digital information on DNA in silica with error-correcting codes,” *Angewandte Chemie International Edition*, Vol. 54, Nr. 8, pp. 2552–2555, Feb. 2015, **featured in Nature as research highlight, press coverage by BBC, CNN, and New Scientist, amongst others**.
- J7 **R. Heckel** and H. Bölcskei, “Identification of sparse linear operators,” *IEEE Transactions on Information Theory*, vol. 59, no. 12, pp. 7985–8000, Oct. 2013.

- J8 **R. Heckel**, S. Schober, and M. Bossert, “Harmonic analysis of Boolean networks: Determinative power and perturbations,” *EURASIP Journal on Bioinformatics and Systems Biology*, vol. 2013, no. 6, May 2013.
- J9 J. Klotz, **R. Heckel**, and S. Schober, “Bounds on the average sensitivity of nested canalizing functions,” *PLoS ONE*, vol. 8, no. 5, May 2013.
- J10 S. Schober, D. Kracht, **R. Heckel**, and M. Bossert, “Detecting controlling nodes of Boolean regulatory networks,” *EURASIP Journal on Bioinformatics and Systems Biology*, vol. 2011, no. 6, pp. 1–10, Oct. 2011.

Refereed conference proceedings

- C1 **R. Heckel**, M. Vlachos, T. Parnell, and C. Dünner, “Scalable and interpretable product recommendations via overlapping co-clustering,” *IEEE International Conference on Data Engineering*, to appear, *arXiv:1604.02071*, 2017.
- C2 **R. Heckel** and M. Vlachos, “Private and right-protected big data publication: An analysis,” *Proc. of SIAM Data Mining 2017*, to appear.
- C3 **R. Heckel** and M. Soltanolkotabi, “Generalized Line Spectral Estimation for Radar and Localization,” *Proc. of Int. Workshop on Compressed Sensing Theory and its Applications to Radar, Sonar, and Remote Sensing, 2016*.
- C4 **R. Heckel**, “Super-resolution MIMO radar,” *Proc. of IEEE International Symposium on Information Theory (ISIT), 2016*.
- C5 **R. Heckel**, M. Tschannen, and H. Bölcskei, “Subspace clustering of dimensionality reduced data,” *Proc. of IEEE International Symposium on Information Theory (ISIT), 2014*.
- C6 A. Jung, **R. Heckel**, H. Bölcskei, and F. Hlawatsch, “Compressive nonparametric graphical model selection for time series,” *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2014*.
- C7 **R. Heckel**, E. Agustsson, and H. Bölcskei, “Neighborhood selection for thresholding based subspace clustering,” *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2014*.
- C8 **R. Heckel** and H. Bölcskei, “Noisy subspace clustering via thresholding,” *Proc. of IEEE International Symposium on Information Theory Proceedings (ISIT), 2013*.
- C9 **R. Heckel** and H. Bölcskei, “Subspace clustering via thresholding and spectral clustering,” *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2013*.
- C10 **R. Heckel** and H. Bölcskei, “Joint sparsity with different measurement matrices,” *Proc. of Allerton Conf. on Communication, Control, and Computing, 2012*, **invited paper**.
- C11 **R. Heckel**, S. Schober, and M. Bossert, “Determinative power and tolerance to perturbations in Boolean networks,” *Proc. of 9th International Workshop on Computational Systems Biology (WCSB), 2012*, **best student paper award**.
- C12 **R. Heckel** and H. Bölcskei, “Compressive identification of linear operators,” *Proc. of IEEE International Symposium on Information Theory Proceedings (ISIT), 2011*.

- C13 S. Schober, **R. Heckel**, and D. Kracht, “Spectral properties of a Boolean model of the E. coli genetic network and its implication on network inference,” *Proc. of the 7th International Workshop on Computational Systems Biology (WCSB)*, 2010.
- C14 **R. Heckel**, S. Schober, and M. Bossert, “On random Boolean threshold networks,” *Proc. of International ITG Conference on Source and Channel Coding (SCC)*, 2010.
- C15 **R. Heckel** and S. Schober, “A Boolean genetic regulatory network created by whole genome duplication,” *Proc. of the 6th International Workshop on Computational Systems Biology (WCSB)*, 2009.

Patents

- P1 **R. Heckel**, V. Vasileiadis, and M. Vlachos, “Method and system for identifying dependent components”, US Patent 20,160,063,392, 2016.
- P2 **R. Heckel** and M. Vlachos, “The obfuscation and protection of data rights”, US 14/805514, filed July 2015.

Invited talks

- Jul., Sep. 2016 “Generalized line spectral estimation via convex optimization”, FAU Erlangen, RWTH Aachen, Germany
- Feb. 2016 “Super-resolution radar and generalized line spectral estimation”, Communications, Networks & Systems Seminar at USC, Los Angeles, CA
- Sep. 2015 “Robust Data Storage in DNA with Error-Correcting Codes”, Leading Edge Embedded NVM Workshop, Gardanne, France
- Jun. 2015 “Super Resolution Radar”, FTW Telecommunications Forum, Vienna, Austria
- Mar. 2015 “Super Resolution Radar”, EPFL-Idiap-ETH Sparsity Workshop, Lausanne, Switzerland
- May 2012 “Compressive identification of linear operators”, 6th IEEE Workshop on Advanced Information Processing for Wireless Communication, Copenhagen, Denmark

Professional service

Journal reviewing: IEEE Transactions on Information Theory, Image Processing, Signal Processing, Neural Networks and Learning Systems, Vehicular Technology; PLOS ONE; Bulletin of Mathematical Biology; Wireless Communications and Mobile Computing; Wireless Networks.

Conference reviewing: Neural Information Processing Systems; IEEE International Symposium on Information Theory; IEEE International Conf. on Acoustics, Speech, and Signal Processing; International Conf. on Sampling Theory and Applications; International Joint Conf. on Artificial Intelligence; ACM SIGKDD Conf. on Knowledge Discovery and Data Mining; IEEE International Symposium on Wireless Communication Systems; International Workshop on Comp. Systems Biology.

References

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