Curriculum Vitae

Alon Kipnis

59 Ben-Gurion Blvd.
Hertzliya 4642140
Israel

alon.kipnis@idc.ac.il
+972-54-5402728
www.stanford.edu/˜kipnisal

Education

- Postdoctoral Research Fellow and Lecturer 9/2017 - 06/2021
  Department of Statistics, Stanford University
  - Advisor: David Donoho.
  - Research Areas:
    + **Multiple testing, sparse signal detection, and variable selection.** Developed procedures for multiple hypothesis testing and feature selection in high-dimensional environments. Applications include text analysis, image classification, genomics, and the broad area of machine learning.
    + **Inference from compressed data.** Studied the fundamental limits of learning and estimation from datasets undergoing bit-level data compression. Specific applications includes sparse regression and compressed sensing from data undergoing quantization or subject to communication constraints.
- Ph.D., Electrical Engineering
  Stanford University (Stanford, California) 9/2012 – 9/2017
  - Advisor: Andrea Goldsmith
  - Thesis: "**Fundamental performance limits of analog-to-digital compression.**" Derived the optimal sampling rate for analog signals under bitrate or quantization constraints. This rate is typically smaller than the Nyquist rate.
  - Oral exam (defense) committee: Tsachy Weissman, John Duchi, Abbas El Gamal, Emanuel Candes
- M.Sc., Mathematics
  Ben-Gurion University (Beersheva, Israel) 10/2010 - 8/2012
  - Advisor: Daniel Alpay
  - Thesis: "**Generalized white noise space analysis and stochastic integration with respect to a class of Gaussian stationary increment processes.**" Developed Itô-type stochastic integration for stationary-increment processes.
- B.Sc., Mathematics *(summa cum laude)*
  Ben-Gurion University (Beersheva, Israel) 10/2007 - 8/2010
- B.Sc., Electrical and Computer Engineering *(summa cum laude)*
  Ben-Gurion University (Beersheva, Israel) 10/2006 - 8/2010

Teaching Experience

- **Instructor**

  - **STATS 285 (Spring 2020-2021), Stanford University**. *Massive computational experiments, painlessly* (with Masha Lofti, Andrew Donoho, and David Donoho)
    This class explores tools for researchers conducting ambitious Data Science projects.
  - **STATS 207 (Fall 2020-2021), Stanford University**. *Introduction to time series analysis*.

- **Teaching assistant**
  - Stanford University, EE 102B: *Signal processing and linear systems II*
  - Ben-Gurion University, MATH: *Calculus II*
  - Ben-Gurion University, MATH: *Algebraic structures (Algebra III)*
  - Ben-Gurion University, EE: *Introduction to stochastic processes*
  - Ben-Gurion University, EE: *Estimation theory*
  - Ben-Gurion University, EE: *Introduction to control theory*

Honors, Awards and Fellowships

- **Koret Foundation postdoctoral fellowship**, 2018-2020
  Stanford University, Statistics Department
- **Keynote Speaker**, October 2018
  Banff Research Stations, a workshop on the Intersection of Information Theory and Signal Processing: New Signal Models, their Information Content and Acquisition Complexity
- **PhD Department fellowship**, 2012-2013
  Stanford University, Department of Electrical Engineering
- **Graduated with Highest Honors**, 2010
  Ben-Gurion University, Department of Mathematics.
- **Graduated with Highest Honors**, 2010
  Ben-Gurion University, Department of Electrical Engineering
- **Rector's list** 2008 ($3,500 value), **Dean's list** 2009, 2007 ($2,100 and $1,500 value, respectively), Ben-Gurion University
- **Wolf Prize for undergraduate students**, 2007 ($1,200 value)

Patents

Pt4 A. Kipnis , Andrea J. Goldsmith and Yonina C. Eldar, "Analog to digital converter optimized for efficiency," 2017

Pt3 A. Kipnis and I. Dror, "Encoding data for storage in a data storage device," 2014

Pt2 A. Kipnis and I. Dror, "Method and apparatus to process data based upon estimated compressibility of the data," 2013

Pt1 I. Dror and A. Kipnis, "Systems and methods for performing variable flash wear leveling," 2013

Previous Employment

- **Reichman University** 9/2021 –
  Senior Lecturer in the School of Computer Science
- **SanDisk** (Omer, Israel) 5/2011 – 10/2012
  Algorithm development
  - High-throughput and low-latency data compression algorithms.

Professional and Volunteer Services

- Active reviewer for:
  - The Proceedings of the National Academy of Sciences
  - The IEEE Transactions on Information Theory
  - IEEE Journal of Selected Topics in Signal Processing
  - The IEEE Transactions on Signal Processing
  - The IEEE Transactions on Wireless Communication

Publications

Submitted Journal Publications

S5 Alon Kipnis. (2021). *Unification of rare/weak detection models using moderate deviations analysis and log-chisquared P-values*.
arxiv:2103.03999 (submitted to Bernoulli)

S4 Alon Kipnis and David Donoho. (2021). *The impossibility region for detecting sparse mixtures using the higher criticism*. arXiv:2103.03218. (submitted to the Annals of Applied Probability)

S3 David Donoho and Alon Kipnis. (2020). *Higher Criticism to compare two large frequency tables, with sensitivity to possible rare and weak differences*. arXiv:2007.01958 (submitted to the Annals of Applied Probability, second revision on 10/2021)

S2 Alon Kipnis and John C. Duchi. (2020). *Mean estimation from one-bit measurements*. arXiv:1901.03403 (submitted to the IEEE Transactions on Information Theory, first revision on 10/2021)

S1 Alon Kipnis. (2020). *Higher criticism for discriminating word-frequency tables and testing authorship*. arXiv:1911.01208 (accepted for publications in the Annals of Applied Statistics)

Journal publications

J10 Alon Kipnis and Galen Reeves. (2021). *Gaussian approximation of quantization error for estimation from compressed data*. IEEE Transactions on Information Theory. vol.67

J9 Alon Kipnis, Stefano Rini, and Andrea J. Goldsmith. (2021). *The rate-distortion risk in estimation from compressed data*. IEEE Transactions on Information Theory. vol.67

J8 Stefano Rini, Alon Kipnis, Ruiyang Song, and Andrea J. Goldsmith. (2019). *The compress-and-estimate coding scheme for Gaussian sources*. IEEE Transactions on Wireless Communications. vol.18

J7 Alon Kipnis, Andrea J. Goldsmith and Yonina C. Eldar. (2018). *The distortion rate function of sampled Wiener Processes*. IEEE Transactions on Information Theory. vol.65

J6 Alon Kipnis, Andrea J. Goldsmith, and Yonina, C. Eldar. (2018). *Fundamental distortion limits of analog to digital compression*. IEEE Transactions on Information Theory. vol.64

J5 Alon Kipnis, Yonina C. Eldar, and Andrea J. Goldsmith. (2018). *Analog-to-digital compression: a new paradigm for converting signals to bits*. IEEE Signal Processing Magazine vol.35

J4 Alon Kipnis, Andrea J. Goldsmith and Yonina, C. Eldar. (2017). *Rate-distortion function of cyclostationary Gaussian processes*. IEEE Transactions on Information Theory. vol.99

J3 Alon Kipnis, Andrea J. Goldsmith, Yonina, C. Eldar and Tsachy Weissman. (2016). *Distortion rate function of sub-Nyquist sampled Gaussian sources*. IEEE Transactions on Information Theory. vol.62

J2 Daniel Alpay and Alon Kipnis. (2015). Wiener chaos approach to optimal prediction. *Numerical Functional Analysis and Optimization*. vol.36 no.10 pp.1286-1306

J1 Daniel Alpay and Alon Kipnis. (2013). *A generalized white noise space approach to stochastic integration for a class of Gaussian stationary increment processes*. Opuscula Mathematica. vol.33.3

Book chapters

BC1 Alon Kipnis, Yonina C. Eldar and Andrea J. Goldsmith. (2021). *An information theory approach for analog-to-digital compression*. Pp 44-71 in *Information-theoretic methods in data science*. Cambridge University Press

Refereed conference publications

C19 A. Kipnis and D. Donoho *Two-sample testing of discrete distributions under rare/weak perturbations*. International Symposium on Information Theory (ISIT), Sydney, July 2021

C19 A. Kipnis, *Higher criticism as an unsupervised authorship discriminator*. Working Notes of CLEF 2020.

C18 A. Kipnis and G. Reeves, *Gaussian approximation of quantization error for estimation from compressed data*. International Symposium on Information Theory (ISIT), Paris, July 2019

C17 A. Kipnis, G. Reeves, and Y. C. Eldar, *Single-letter formulas for quantized compressed sensing with Gaussian codebooks*. International Symposium on Information Theory (ISIT), Vail, June 2018

C16 G. Murray, A. Kipnis, and A. J. Goldsmith, *Lossy compression of decimated Gaussian random walks*. 52nd Annual Conference on Information Sciences and Systems (CISS), Princeton, March 2018

C15 A. Kipnis and J. C. Duchi, *Mean estimation from adaptive one-bit measurements*. 55th Annual Allerton Conference on Communication, Control, and Computing, Illinois, October 2017

C14 A. Kipnis, G. Reeves, Y. C. Eldar and A. J. Goldsmith, *Compressed sensing under optimal quantization*. International Symposium on Information Theory (ISIT), Achen, June 2017

C13 A. Kipnis, S. Rini, and A. J. Goldsmith, *Coding theorems for the compress and estimate source coding problem*. International Symposium on Information Theory (ISIT), Achen, June 2017

C12 R. Song, S. Rini, A. Kipnis, and A. J. Goldsmith, *Optimal rate-allocation in multiterminal compress-and-estimate source coding*. Information theory workshop, Cambridge, September 2016

C11 A. Kipnis, A. J. Goldsmith and Y. C. Eldar, *Information rates of sampled Wiener processes*. International Symposium on Information Theory (ISIT), Barcelona, July 2016

C10 A. Kipnis, S. Rini, and A. J. Goldsmith, *Multiterminal compress-and-estimate source coding*. International Symposium on Information Theory (ISIT), Barcelona, July 2016

C9 M. Rao, A. Kipnis, T. Javidi, Y. C. Eldar and A. J. Goldsmith, *System identification from partial samples: non-asymptotic analysis*. IEEE 55th Conference on Decision and Control (CDC), Las Vegas, December 2016

C8 A. Kipnis, A. J. Goldsmith and Y. C. Eldar, *Optimal trade-off between sampling rate and quantization precision in A/D conversion*. 53rd Annual Allerton Conference on Communication, Control, and Computing, Illinois, October 2015

C7 A. Kipnis, S. Rini, and A. J. Goldsmith, *The indirect rate-distortion function of a binary i.i.d source*. Information Theory Workshop (ITW) IEEE, Korea, October 2015

C6 M. Chowdhury, A. Kipnis, and A. J. Goldsmith, *Reliable uncoded communication in the quantized SIMO MAC*. International Symposium on Information Theory (ISIT), Hong Kong, July 2015

C5 A. Kipnis, A. J. Goldsmith and Y. C. Eldar, *Optimal trade-off between sampling rate and quantization precision in Sigma-Delta A/D conversion*. International Conference on Sampling Theory and Applications (SampTA), Washington D.C., May 2015

C4 A. Kipnis, A. J. Goldsmith and Y. C. Eldar, *Sub-Nyquist sampling achieves optimal rate-distortion*. Information Theory Workshop (ITW) IEEE, Jerusalem, April 2015

C3 A. Kipnis, A. J. Goldsmith and Y. C. Eldar, *Rate-distortion function under sub-Nyquist nonuniform sampling*. 52st Annual Allerton Conference on Communication, Control, and Computing, Illinois, October 2014

C2 A. Kipnis., A. J. Goldsmith and Y. C. Eldar, *Rate-distortion function of Gaussian Cyclostationary processes*. International Symposium on Information Theory (ISIT) IEEE, Honolulu, July 2014

C1 A. Kipnis., A. J. Goldsmith, T. Weissman and Y. C. Eldar, *Rate-distortion function of sub-Nyquist sampled Gaussian processes corrupted by noise*. 51st Annual Allerton Conference on Communication, Control, and Computing, Illinois, October 2013

Invited Talks

- "Two-sample problem for high-dimensional multinomials and testing authorship"

  T23 **UC Berkeley**, BLISS Seminar 2/2020
  T22 **Stanford University**, Statistics Department Seminar 2/2020
  T21 **Stanford University**, Information Theory Forum 1/2020

- "Gaussian approximation of quantization error for estimation from compressed data"

  T21 **Information Theory and Applications** 2/2019

- "Information efficient data acquisition using analog-to-digital compression" (**keynote talk**)

  T20 **Banff International Research Stations (BIRS)**. A workshop on the Intersection of Information Theory and Signal Processing: New Signal Models, their Information Content and Acquisition Complexity 10/2018

- "Compressed sensing under optimal quantization"

  T19 **UC San Diego**, Electrical & Computer Engineering Seminar 5/2018
  T18 **Tel-Aviv** University, Electrical Engineering Seminar 3/2018

- "Fundamental distortion limits of analog-to-digital compression"

  T17 **Stanford University**, Vision and Learning Lab 3/2017
  T16 **Duke University**, Signal Processing/ECE Seminar 5/2017
  T15 **University of Maryland at College Park**, Information Theory Seminar 3/2017
  T14 **Georgia Tech**, Electrical & Computer Engineering Seminar 4/2016
  T13 **MIT**, Research Laboratory of Electronics seminar 2/2016

- "From Brownian motion to bits (and back)"

  T12 **Chapman University**, "Mathematics, Signal Processing and Linear Systems: New Problems and Directions" 11/2017
  T11 **Ben-Gurion University**, Electrical & Computer Engineering Seminar, 12/2016
  T10 **Stanford University**, Information Theory Forum 11/2016

- "Shannon meets Nyquist: Rate-distortion of sub-Nyquist sampled processes"

  T9 **Santa Clara**, Silicon Valley IEEE Signal Processing Society 11/2015
  T8 **Stanford University**, Information Theory Forum 10/2015
  T7 **New York University**, Electrical & Computer Engineering Seminar 8/2015
  T6 **Rutgers University**, Electrical & Computer Engineering Seminar 8/2015
  T5 **Bell-Labs**, NJ 8/2015
  T4 **Princeton University**, Electrical Engineering seminar 7/2015
  T3 **Technion**, Signal Processing Seminar 1/2014
  T2 **Tel-Aviv University**, Signal Processing Seminar 1/2014
  T1 **Ben-Gurion University**, Electrical & Computer Engineering Seminar 12/2013